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The decision of the Supreme Court upholding the Interstate Commerce Commission in what may be called the boldest order that it ever made, that in the Mississippi-Missouri River case, foreshadows the final triumph of the idea that, as judges of the facts in railway rate questions, the Interstate Commerce Commission shall be recognized as the supreme authority. If the commission keeps within the rules of the law and the decisions of the courts on law questions, its ability to judge what is a reasonable rate will not be questioned. And yet, this decision is barely carried—4 to 3—so the full text of the decision and of the views of the dissenters will be awaited with great interest. As the agitator who calls himself a "shipper" has at last learned how to "claim everything," and to do the job with much skill, the questions which will come before the commission in the immediate future promise to be of the weightiest character. It is to be hoped that increased power will give the commission an increased sense of responsibility. And as a majority of the members of Congress and apparently about 90 per cent. of the voters of the country seem to think that any measure of rate regulation which comes short of confiscating the railways' property is not only reasonable but desirable and necessary, those railway officers who have the ability to educate public opinion must now gird up their loins for renewed efforts at their Herculean task. As all true education depends not only on sound logic but also on the fullest possible knowledge of all the facts involved, it will mean much for real progress toward a really intelligent public opinion if there can be more frankness in the presentation of railway arguments, with entire freedom from sophistry.

The second annual meeting of the Railway Fuel Association did not fulfil the expectations raised by the initial meeting held last year. The papers were hardly as good as last year's and the discussions were unduly prolonged by a few speakers who often prevented general and profitable discussion. The representatives of the coal producers did not take any very active part either in the preparation of papers or in the discussions, this being due partly, no doubt, to the fact that they were actively engaged in negotiating with their employees about wages. The economic relation of the coal and lumber businesses to that of the railway is a matter which should be treated in a more business-like manner. There are questions relating to the fuel supply of railways, for example, which involve the quality of coal, its preparation and sizing, inspection and shipment, etc., which could be investigated by committees composed of representatives of both producers and consumers and presented in reports giving valuable facts and figures which would be worthy of record and which could be used to advantage by the members of the association in investigating their own local conditions. It is work of this kind, with earnest general discussion, which will make the fuel association useful and helpful to the railways and to those who purvey to them. The value of personal contact outside of the meeting hall and the value of conversation among fuel specialists is perhaps equal to that of the formal session, and it alone may well justify the anuual meetings. Instruction relating to methods of nring and economical coal combustion on locomotives is making good progress, and is becoming so specialized that some railways have instruction cars for this purpose, and special classes and instructors in the school rooms at terminals. All of this involves elementary education which may properly be considered by the association, but its time must not be too fully occupied by such matters or it will become little better than a primary school.

The Interstate Commerce Commission's statistical report for the year ending June 30, 1907, came out about a year and a half ago. Ever since then searchers for the various kinds of information that have to be got out of this book have been told "Nothing yet published that is less than 17 months old; nothing less than two years old," and so on down to

the first of the present month, when it was "Nothing less than two years and ten months old." At last the Government Printing Office has issued the "text" of the report for 1908, which the statistician finished last September. These figures are one year and ten months old. The railways took two months to make the reports, the statistician took a year to do his job, and the printer eight months to do his.

The voluminous tables which make up the bulk of the book are still in the printer's hands, so his part of the work is still unfinished. The impairment of the value of these statistics by old age is now more regrettable than ever, because a number of new features have been introduced, more useful than what has been given in former years. The statistical report for 1908 gives a table showing the primary expense accounts for the systems of roads as they are grouped by the commission. That is, it is possible to find what the Pennsylvania—meaning the Pennsylvania system—spent as a whole for ballast, or for any other of the primary accounts under maintenance of way; and so for each one of the 58 systems in the country operating more than 500 miles of line each. These 58 systems on Dec. 31, 1909, operated 210,479 miles of road, or nearly 89 per cent. of all the railways in the country. This grouping of roads in systems and the publication of the details of expenses should be of considerable value in making comparisons, especially if taken in connection with the tables showing road and track mileage and details of equipment. Unfortunately this information as to mileage and equipment is not given in the tables, so that for these figures the student of the affairs of any particular road would have to go to the reports of the company. The monthly statements of revenues and expenses that are now being published by the commission have been described before. The present report says that it is proposed to publish these reports within 60 days of the close of the month to which the figures apply, one month being allowed for railways to compile their statements, and the remaining 30 days being used for compilation and publication at Washington. The commission, however, requires the report to be made in duplicate, and as soon as it receives them makes one set of reports at once accessible to the public, that is, to anyone calling at the office of the commission. This is a long step in the right direction of furnishing to the public as promptly as possible the information which the commission gathers. When this 1908 volume finally appears in its complete form we shall have also, says the statistician, a complete income account and profit and loss account for each road.

The Pennsylvania Railroad reports that in the two years ending December 31 last only one passenger was killed in a train accident, though the number of passengers carried was 299,762,658. This record is that of the whole of the Pennsylvania system, embracing 11,180 miles. The passenger mileage was 7,170,568,517. The number of passenger train collisions in 1909 was two less than in 1908 and of freight train collisions 15 less. The number of freight train derailments was 69 less. The passenger train mileage of the system for the two years was over 118,000,000, equal to running a train nearly 5,000 times around the world. The freight train mileage during the same time was about 125,000,000. This is a fine record, whatever the basis of comparison, but it is fair to add, as does the company in its statement, that the track mileage of the Pennsylvania—24,000 miles—is large in proportion to the road mileage, indicating that it is a busy road. On a system so largely made up of four-track lines the enormous freight train mileage is a significant item in a record of safety, for to keep passenger trains safe it is necessary to maintain high standards also in the construction and operation of the freight tracks and freight cars. The passenger death record here given for the 118,000,000 train miles in two years is the same as that of the railways of Great Britain and Ireland for the same two years—one death in each case. In Great Britain during that time the passenger train mileage was probably over 500,000,000, and the freight train mileage about 330,000,000. Looking at percentages alone this might seem to indicate that the British railways are tnree or four times as safe as the Pennsylvania; but to see the unreliable character of comparisons between such exceedingly attenuated ratios as 1 in from 300,000,000 to 3,000,000,000, we need only observe the record of the year 1910, which will include the Stoat's Nest derailment on the London Brighton & South Coast in January, in which 8 persons were killed. This will reduce the British roads' ratio of safety, in the item which we are considering, from 1 in 3,000,000,000 to 1 in 400,000,000, calculating roughly. The pleasing thing to remember is that both on the railways of England and on those with which comparison is here made, the officers are striving to make the lives of passengers as safe as possible, without regard to the fine-spun mathematical studies of the statistician.

STATISTICS OF RAILWAYS FOR YEAR ENDED JUNE 30, 1908.

The text, twenty-first annual report of Statistics of Railways of the United States, covers the year ended June 30, 1908. An abstract of the preliminary figures, as given out by the Interstate Commerce Commission, was published in the *Railway Age Gazette* of January 10, 1910. With the putting in effect of the classification of expenditures for additions and betterments and the final ruling on the form of general balance sheet statement, the general structure of the accounting system prescribed by the Interstate Commerce Commission and prepared under the direction of Prof. Henry C. Adams has been completed. The general form prescribed for revenues and expenses and freight and passenger statistics has now been in use for some time, and its merits and demerits have been quite fully discussed. The form of general balance sheet, however, was prescribed, effective July 1, 1909, and in his latest report Professor Adams comments on this form at some length. He says that in preparing a balance sheet there are three conflicting interests which the balance sheet may be made to serve—the interest of the management, the interest of the investor and the interest of the public.

Briefly, the interest of the management, according to Professor Adams, is to make the cost of property correspond as closely as possible to the outstanding stock and bonds, and the proper interest of the management should be to make this cost of property as low as possible; in other words, to charge to expenses not only cost of running the property, but also cost of improvement of the property. This ideal management has as its aim the showing of the greatest possible margin between earning power of the railway and interest and dividend requirements. If the betterment of the property is *not* capitalized dividend and interest charges do not increase.

The interest of the investor—and by this Professor Adams apparently means of the stockholder—is to have the showing of the value of the property, over and above the par value of outstanding securities, as high as possible, because of the effect on the market price of the securities. Also, he wants the value of the property, whatever the amount of securities issued against it, to be carried at as high a figure as possible, so that in a dispute as to freight rates the investor may claim a fair return on as high as possible cost of property.

The interest of the public—and this, of course, is the interest that Mr. Adams has in mind when prescribing a form of general balance sheet—demands that the "property ledger should record every item of property which an appraiser would find should an appraisement be undertaken, and from the point of view of the public, at least, the figures entered on the property ledger against the several items of property there recorded should be the amount of money actually spent in creating the property rather than, as the management de-

sires, the amount of securities issued, or, as the stockholder desires, the commercial valuation of the property." As a matter of fact, the public's real interest is better served by a balance sheet drawn up on the lines suggested by Professor Adams as being in the interest of the management than by any other method of making a balance sheet. A fundamental error that underlies Professor Adams' discussion of the balance sheet is in the assumption that were it possible to get at a physical valuation of railway property it would suddenly become possible to determine what is a fair freight rate. The drawing up of a balance sheet is the final step in the rendering of an account by the management of a property to its owners. The intimate relationship and responsibility of a management to the owners of the property should be kept clearly distinct from the general responsibility of a railway company to the public. Freight rates come in the later class of responsibility and should be as utterly disregarded in the discussion of the balance sheet as in practice the form of the balance sheet is disregarded in making a freight rate.

There can be no dispute as to the right of the public to know what is being done, but all of the essential information required by the public is so fully covered by the income statement and the statement of revenue and expenses prescribed by the Interstate Commerce Commission, that it is the public's own fault if they do not know the facts.

The theory on which the balance sheet of the Interstate Commerce Commission is drawn up is that since it is impossible to get a physical valuation of railway properties, the estimate made by the railway management of the valuation of the property on June 30, 1907, will be taken for a starting point, and each year this sum shall be written up, as it is called in bookkeeping, that is, increased by the sum of everything which is spent to better or improve the property. For illustration, we will assume that bare maintenance of a certain property last year cost $1,000,000, and in the judgment of the management the property, to render adequate service to the public and to keep abreast of its competitors, needed an additional $500,000 spent on it for improvements and betterments. The management may decide that half of this sum, $250,000, actually increases the earning power of the property, and therefore it is good business policy to capitalize this $250,000 and issue securities to reimburse the treasury. The other $250,000, in the judgment of the management, who, we must remember, are responsible to the owners of the property to keep its earning capacity unimpaired, ought properly to be charged to the income from the property this year. Thus far good business management and the theory of the commission agree, but now good business demands that this sum be charged to expenses and entirely written off, so that the balance sheet will show only an increase of $250,000 in the value of the physical property owned.

The commission holds that this $250,000 spent from income has increased the value of the property by just that much, so that the balance sheet shows a total increase of $500,000, and that since the sum of $250,000 was spent from income and was not capitalized, it is a liability of the business to the owners, that is, the stockholders. Therefore, $250,000 is credited on the balance sheet as a liability under the head of appropriated surplus, there is no guarantee to a stockholder that at some later time the management will not capitalize this appropriated surplus. The theory that everything spent on the property which does not come under the head of expenses (theoretically determined by the commission) adds to the value of the property may be good theory, but it is unquestionably bad business.

If the stockholder is injured through a mistake in the theory of the commission he has no means or redress; if he is injured through the bad business judgment of the management he can at least change the management.

RAILWAY BONDS IN EUROPE.

In 1906 the Pennsylvania Railroad placed successfully a loan of $50,000,000 with a French syndicate which took and marketed that amount of 3¾ per cent. 15-year bonds. The next year came the so-called "European loan" of the New York, New Haven & Hartford—$27,985,000 twenty-five year 4 per cents, taken by a French and German syndicate. These two may be considered pioneer loans of the kind; and, in the case of the New Haven's loan, the experience of the high rate paid when subtractions were made for taxes and commissions was not then such as to encourage a repetition of a foreign loan venture. In the interval of three years since then, the home market, except during the last six months, has been, generally, able to digest new railway bond issues. During a large part of the time, as was natural in a post-panic period, investors turned to good railway bonds—included in that term being the large issues of short notes of dividend-paying companies—as alternatives to securities of a junior type and more speculative. With the return of prosperity, owing to various causes, not only has the American bond market narrowed but the interest rate requirement has increased. Railway companies have, therefore, during the last few months been turning to foreign markets. Including the St. Paul issue of $50,000,000 fifteen-year 4 per cents, the total negotiations in England, France and Germany, since January 1, 1910, have been probably well up toward $300,000,000.

There is one feature of this striking movement which does not seem to have been noticed or, at least, not sufficiently emphasized. Practically all of these bond placings have been those of American steam railway corporations. One loan of a prosperous telephone company, amounting to $15,000,000, appears to have been the only noteworthy exception; and the failure last year—though due to government intervention—to secure French listing of United States Steel stock is in this connection a point worth passing notice as evidence of the foremost place of the railway in the foreign investor's mind. This is logical and, in a sentimenal investment sense, psychological. The European investor apparently resembles the American investor in his views on the railway security. The railway is an old institution. Under honest conditions of operation and with fair judgment in the original project it has demonstrated its stability and value. It has survived the shocks of panic and of legislative attack, and, in many cases, even the deeper perils of "high finance." Naturally the conservative foreign investor first turns to it. In our own country the historical order of conservative railway investment has been first the property near home; second, the property further away ranging from the old frontier to the Pacific; and, later still, there has been considerable diversion of railway investment into street railway and industrial securities, attracted by the higher rate of interest, and which, but for stock watering, would have come sooner. The foreign investor is now at that secondary stage when from ultra-conservative and low return investment at home he turns to conservative investment away from home—with the railway most prominent in his fiscal eye. And the old investment demand for the American railway bond, large as it has been and "digesting" a big amount of securities, promises to grow larger still and more systematic. The European private transaction is expanding into the syndicate transaction.

Looked at from our own side of the Atlantic there are some other interesting phases of these foreign bond dealings. It is undoubtedly true that the railways are paying—in the interest rate—a high price for these foreign sales. The rate of the St. Paul loan, for example, with syndicate profits, commissions and taxes out, is estimated at from 5.10 to 5.50 per cent. annually, and other loans probably run still higher. At such a high return as that it would seem as though our home market ought to absorb a promise to pay of a strong dividend-paying railway. There is, however, a more ultimate and far-sighted view taken by some, at least, of the railway

financiers. The large loans abroad are at bottom an exploitation of a new field of investment. As their high security becomes evident to the foreign investor, and also more familiar, future loans of the kind can be negotiated on better terms. The loans break the way for a broader foreign market hereafter, at the same time relieving the home market of any glut of bonds; and finally, by reflex action, very likely lowering the interest requirement and rate here as well as abroad. Nor is it a bad thing for us in times of railway legislation to have the foreigner holding the security for which we have received the cash. Admit that he spends the interest abroad—or most of it—yet is this country the richer by the added earning power of the railway plant built by exotic funds. One may even go further and cite a certain added respect by nation and states for the foreign-held debt, shared by every legislator except the one of the type of him who years ago was the inverted hero of the phrase, "What have we to do with abroad?"

Assuming that the negotiation of railway loans abroad reaches large proportions, it has, on the other hand, both its limits and its perils. Its limits may be somewhat vaguely descried in its drain of foreign capital, the consequent higher interest to be obtained by the foreign investor in his home market, and, possibly, new governmental limits in the form of high taxation, already prejudicial to the loans in France. In the line of positive danger is the probability that the success of conservative railway bonds in Europe will later tempt the foreign investor into other bonds less conservative, where final defaults would seriously impair our foreign credit. It is here that the call comes for the foreign bankers and syndicates to be on the watch lest their gilt edged underwritings be followed by speculative underwritings. To them, even more than to the individual investor, the *caveat emptor* applies. The new movement should blaze the way to higher railway credit, not lower. And along with the satisfaction that the foreigners are taking *en bloc* our railway bonds, first should go rational precaution that the foreign investor should not suffer at the last.

NEW BOOKS.

Bridge and Structural Design. By W. Chase Thomson, Assistant Engineer, Dominion Bridge Co., Montreal, Que. The Engineering News Publishing Co., New York. Second edition. Cloth; 6 in. x 9 in.; 192 pages; illustrated. Price, $2.00.

The draftsman or designer who is not a graduate of a technical school is handicapped by his lack of acquaintance with mathematics, mechanics and the properties of materials. In a few offices classes are formed for instruction, and to some extent the gulf between graduate and non-graduate draftsmen is bridged. In 1905, Mr. Thomson published a little book containing lessons given by him to draftsmen employed by the Dominion Bridge Co. The language was plain and the mathematics simple, so the book became popular with the men for whom it was intended. This second edition has been entirely rewritten and the number of pages nearly doubled. Chapter I contains definitions, composition and resolution of forces, the lever and moments. Chapter II treats of shearing and bending stress in beams with formulae relating to beams and gives worked examples for beam sizes. Chapter III discusses deflection of beams, and Chapter IV columns and struts. Chapter V takes up loads and unit stresses with rivets and riveting. The remaining chapters contain worked examples of structures, those discussed being, in order: Example in Office Building Construction; Design of a Simple Roof Truss; Design of Roof Truss Supported by Steel Columns; Design of a Plate Girder; Design of a 50-ft. Through Warren Girder Highway Bridge; Design of a 120-ft. Pin-connected Pratt Truss Highway Bridge. The simplicity and clearness of statement of the first edition have been preserved in this new edition. It would be difficult, well-nigh impossible, to simplify the mathematical work. No calculus is used and the equations given are elucidated by worked-out examples.

CAR LOAD RATINGS AND MIXED CAR LOADS.*

BY R. N. COLLYER,
Chairman, Uniform Classification Committee.

The year 1887, which witnessed the establishment of the Interstate Commerce Commission and the nationalization of public regulation of carriers, also marked the important step toward classification uniformity, when the Westbound, Eastbound, Joint Merchandise and Middle and Western States Classifications were merged into the Official Classification. The publication of this consolidated issue was the signal for an attack on the carriers, of great importance at the time, the effect of which seems to be very clearly in evidence to-day.

Complaint was made against the several eastern trunk lines by Thurber and others representing the New York Board of Trade; by T. L. Greene, of New York, manager of the Merchants' Freight Bureau and representing 281 retail merchants in six different states; and by F. H. Leggett & Co., of New York. Although these cases are based on the complaints of different parties, the principles underlying them are the same, and because the commission in its decision laid down several fundamental rate and classification propositions, and because the immediate and later effects of the cases have apparently been so far reaching, I wish to direct your attention to them in some detail.

The complaints alleged violations of sections 2 and 3 of the act (which forbid unjust discrimination and undue or unreasonable preference or advantage). The objection to the new classification was stated to be that it classified a great number of articles, particularly grocery staples, in less than carload quantities, at a higher rate than they were classified in the former Westbound Classification, which made fewer distinctions between carload and less than carload quantities. It was further claimed that the difference in rates between C. L. and L. C. L. shipments was too great, and was not justified by the difference in the cost of transportation, and therefore constituted an unjust discrimination prohibited by the Interstate Commerce Law. The complaints filed August 1, 1887, were argued through 1888 and determined in 1890.

The cases possess unusual interest for us from a traffic standpoint, because in them (a) the jobber makes his plea for classification construction calculated to conserve his interests in shipment from the eastern distributing points; (b) the carriers in a successful defense of the classification make it clear that their interests from the standpoint of net revenue warrant the establishment of carload ratings, and incidentally that insofar as this may favor the eastern producer and hurt the eastern jobber, the eastern carrier accepts the responsibility for that result; and (c) finally because in these cases the equity of higher rates for less carload than for carload quantities of freight is upheld and the resulting discrimination is justified.

In meeting this attack the trunk lines made an exhaustive study of conditions surrounding the transportation of carload vs. less carload freight and while we cannot get into the case thoroughly we may judge their views by several quotations from the argument prepared by Albert Fink, then commissioner for the trunk lines:

"From statements, comprising not only the result of observation at New York, but at other points in the country, the great difference in weight in loading a car with miscellaneous freight and with carload freight is fully established. This marked difference is not the result of any local or accidental causes, but is founded in the fixed and permanent conditions under which C. L. and L. C. L. freight has to be transported. In regard to carload lots entitling shippers to lower rates a guarantee is given that a certain amount of tonnage will be forwarded in one car on the same day, which tonnage utilizes the carrying capacity of that car to its full, or to a considerable extent. In the case of miscellaneous freight no such guarantee is given. This freight is offered in small lots directed to many consignees at different destinations, and the carriers assume the risk of getting a sufficient quantity of freight to utilize the carrying capacity of the cars. The freight must be forwarded, whether there is a sufficient quantity or not. As a rule it is found that there is not, and most of the cars have to be forwarded

*From a paper read before the New York Traffic Club, April 26, 1910.

with comparatively small loads in them. It may happen sometimes, as is likely to be the case with freight destined to large trade centers, that a sufficient quantity of miscellaneous freight can be collected together to make a full carload or a load equal to the prescribed C. L. lot minimum weight, but these cases are the exception to the rule. This is fully proved by the fact that the average load of miscellaneous freight, per car, is so small. If there were many such cases it would raise the average weight of miscellaneous freight per car more nearly to the average carload quantity.

"Assuming that the average load of miscellaneous freight is 7 tons per car, and the average load of carload freight is 15 tons, which is the highest average loading of L. C. L. freight, and the highest of C. L. freight, as ascertained by observation on the different trunk lines, the cost of hauling L. C. L. freight would be 47 per cent. greater than C. L. freight. Taking the lowest average of C. L. freight at 14 tons, and the lowest average of L. C. L. freight, 4.3 tons, the increased cost of L. C. L. freight as compared with C. L. freight would be 100 per cent. If an estimate were based on the highest average C. L. and the lowest average L. C. L. shipment, the difference would be still greater.

"While it is impossible to fix exactly the difference in cost, there can be no doubt that the limits of these differences may be considered to lie between 47 per cent. and 100 per cent. This, however, does not include the increased cost of the terminal expenses, handling, loading and delivering L. C. L. freight, which at New York are shown to be 3 cts. per 100 lbs., and which is greater at local stations than at large terminal stations, nor does it include the additional cost of such miscellaneous or L. C. L. freight as has to be transferred en route to destination, which is about 2½ cts. per 100 lbs.; neither does it include the increased cost of hauling and distributing small quantities of freight between the local stations of a road, which is very considerable, as compared with the cost of carload or through freight."

Several sound propositions were enunciated in the Interstate Commerce Commission's decision, but the most tangible result to complainants is found in the following:

"Under the Official Classification, the articles known in trade as grocery articles are so classified as to discriminate unjustly in rates between carloads and less than carloads upon many articles, and a revision of the classification and rates to correct unjust differences and give those respective modes of shipment more relatively reasonable rates is necessary, and is so ordered."

Your attention has been invited to these cases because of their having been the force which accelerated the tendency toward an increase in the proportion of carload ratings. The classifications which in 1887 were merged into the new Official Classification show the following comparison in articles classified:

Classification.	Articles classified.	Carload items.	Percent. of C.L. to total.
Middle and Western States	1,689	905	54 per cent.
Eastbound	1,763	773	44 "
Westbound	1,021	137	14 "
Official No. 1	2,580	1,211	46 "

The eastern carriers having made a pretty fair start in the number of carload ratings, a valiant defense of the carload principle and a strong case for the economic soundness of the carload unit, it is interesting to note the logical result, in the steady increase in the proportion of carload ratings to the whole number of items classified, as shown in succeeding issues of the Official Classification:

	Ratings		
Official classification effective.	Total.	C. L.	Proportion, C. L. to total.
1. April 1, 1887	2,580	1,211	45 per cent.
4. Aug. 15, 1888	2,093	1,674	54 "
6. Aug. 15, 1889	3,571	2,012	56 "
8. Feb. 2, 1891	4,523	3,015	66 "
31. Jan. 1, 1908	5,852	4,325	72.4 "

It will be noted that during the time in which the cases were being argued the proportion of carload ratings increased from 46 per cent. to 56 per cent., and that in the year of the decision this proportion mounted to 66 per cent. This was followed by a slight recession and then the proportion increased gradually to the present figure of 72.4 per cent.

I have referred to the change in the situation westbound from the East, because it serves to illustrate the growth of the Official Classification away from the other classifications in this important matter, to wit: the establishment of carload ratings for the express purpose of encouraging the movement of freight in carload quantities, as contrasted with the establishment of carload ratings only when and insofar as the fostering of commercial interests made carload ratings necessary.

This difference in practice is at the root of a very live issue in the construction of a classification to apply throughout the country. In Mr. McCain's report, to which I have referred, the relative proportion of carload to less than carload ratings in the western and southern territories is shown in the following tables, to which I have added the figures representing present conditions:

	Classification					
	Western.			Southern.		
Year.	T'l items.	C. L.	Ratings, per cent.	T'l items.	C. L.	Ratings, per cent.
1887	1,672	666	39.83	1,177	175	14.87
1893	3,658	1,731	47.32	1,752	270	15.41
1908	5,229	1,690	29.8	3,503	773	22.1

It will be seen from the foregoing that while in the Official Classification there has been a steady growth both in the number and in the proportion of carload ratings to the whole number classified, in the Southern Classification there has been a much smaller growth in number and proportion, while in the Western Classification there seems to have been a slight increase in number and a radical decrease in the proportion of carload ratings to the whole.

It would seem unnecessary to do more than remind you that the manufacturer's interest usually lies both in the receipt of raw materials and in the outward movement of products, in round lots, while the jobber who may take in the carload is interested in redistribution over the widest range of territory possible on any quantity basis. It is obvious that the eastern lines with the great preponderance of manufacturing interest will find self-interest in one direction, while other territories with a different commercial balance, will view the question each as its own self-interest indicates, and that this attitude of the lines on these questions will be modified by commercial changes growing particularly out of increases in manufacturing.

P. W. Doyle, Commissioner of the Traffic Bureau of the Business Men's League of St. Louis, has outlined what seems to me to be not only the full flower of the jobber's view of rate making, but also the complete antithesis of the manufacturer's view as represented in the Official Classification principle of carload ratings. While these are Mr. Coyle's personal views and will doubtless be held by some to be academic and impractical, I am glad that in this expression the jobbers' theory of distribution has been followed to its logical conclusion.

I placed them before you with greater pleasure because of the frank avowal of selfishness therein, an acknowledgment which in no way weakens the force of the presentation from his standpoint:

"This Bureau stands on the general proposition that there should be no carload ratings except on articles requiring the entire use of the car for their transportation, such as basic commodities, structural material, or agricultural products, etc., shipped in bulk.

"We are a jobbing and distributing community, and applying the element which always exists in trade—selfishness—we do not desire to stimulate the growth of other jobbing or distributing interests, but aim to distribute our commodities as far as possible, direct to the retailer or consumer. While this policy, we believe, redounds to our interest, it must necessarily also redound to the interests of the carrier.

"We contend, as a matter of principle, that there should be but one unit of weight as the basis of rating, except, of course, as to the cases above enumerated; or that when the carload unit is also used on commodities taking less than carload rates, there should be no greater difference between the C. L. and L. C. L. ratings than that which can be measured by the expenses of handling which is borne by the shipper instead of the carrier, and the element of risk, which may be avoided by more careful or secure loading as a result of the method of loading by the shipper. Any greater difference we believe should be viewed, and quite reasonably so, as an unreasonable discrimination in favor of the carload shipper. It may be said in support of a greater difference between C. L. and L. C. L. ratings that the average per car loading is greater under the C. L. rating. If that be true and is a proper element to be taken into account as between individuals or commodities, we believe it should be applied as between shippers or committees.

"In connection with this Bureau we have a committee for the purpose of scrutinizing the quality of transportation furnished by the several lines radiating from this city and based upon the facts which we are thus able to obtain, the facilities of the Bureau are used with a view to so concentrating our shipments as to give as great daily tonnage as possible to the lines furnishing the best service. In this way we largely increase, and practically guarantee daily movement of, less than carload shipments in carloads.

"Therefore, if the average loading is to be taken into account as an element of rating, we should have a lower rating on shipments thus handled in through package car service. Obviously, however, this would be a discrimination in favor of the shippers using the package car service as against other less than carload shippers or other communities where such shipments could not be thus concentrated; but as we view it, a no greater or more unreasonable discrimination than taking into account average loading as an element in making carload ratings. On the other hand, it might quite reasonably be contended that the carriers should have greater compensation for handling shipments in carloads, because of the better or more expeditious service which can be rendered on shipments thus handled. Hence, viewed from that angle, if there should be any discrimination in the rating of packages or general merchandise shipments, it might, in our estimation, be more reasonably based on preferred service than on the double unit of loading."

There opinions are recognized as being widely at variance with the practice of the Eastern lines, but in so far as they are in agreement with the practice of Western and Southern lines they must be faced in the effort to reach uniformity in classification.

I suppose we may assume that ethically there should be one rate unit for any given article offered for shipment between specified points, in a specified form, and that the carrier as a public servant is not justified in recognizing quantity as an element that justifies differing rate units.

Certainly there is no inherent right to a rating for freight proportioned to quantity. As an abstract question of right there should be no variation of the charge per unit for any given service offered by a public service corporation, dependent upon quantity. Otherwise our boasted equality of privilege would take flight. If there is one rate per unit dependent upon the shipment of 100 lbs. of freight, and a less relative charge for the movement of 30,000 lbs., in theory the lower cost unit should be followed into trainloads, as well as to carloads. Many traffic men, failing to see that the C. L. rating is a discrimination, although justified, fall into the error of supposing that the carrier can base rates on quantity beyond carloads. Practice and the authorities have recognized that a carload unit may be justified by difference of expense in handling, but beyond the carload there has been, so far as I know, no unit of charge for a greater quantity at a lower rate, nor can there be, without great danger to carrier and public alike.

The carload movement of freight is a thing of growth from small beginnings and the normal rate may be accepted as the smaller unit, the one within the reach of every shipper; therefore, it seems reasonable to assume that until the growth of business has shown the necessity for a carload rating, no such rating should be made.

When the time has arrived for the establishment of a carload rating, that rating should be made largely with respect to the lesser quantity rating previously established and the spread between the ratings should be made with respect to the carriers' approximate saving in transportation.

Unless some unusual conditions exist there should be no such spread as between first and fifth class, which on the New York-Chicago scale represents an advantage for the carload shipper of 150 per cent. as compared with his smaller competitor. There is no ordinary condition of transportation warranting such a spread, and its existence is hazardous alike to the carrier and the public. On this the commission said:

"A difference in rates upon carload and less than carloads of the same merchandise between the same points of carriage so wide as to be destructive to competition between large and small dealers, especially upon articles of general and necessary use, and which, under existing conditions of trade, furnish a large volume of business to carriers, is unjust and violates the provisions and principles of the act."

In Mr. Fink's able presentation, the average per car loading for merchandise from New York by all lines was shown as between 4.3 tons and 7 tons. Since that time there has been an intensification of competition for merchandise from New York, a large increase in the distribution of merchandise cars and a steady increase in the number of carload ratings, and I am satisfied from inquiry that the eastern line merchandise loading will not exceed 10,000 lbs. per car under favorable circumstances, and this figure approximates the minimum figure cited by Mr. Fink 20 years ago. One of the eastern lines making a specialty of merchandise movement has favored me with advice of averages which also indicates that so far as that company is concerned there has been no increase in the average merchandise tonnage per car, while the report of the same company indicates an increase of 60 per cent. in the average loading of C. L. freight. These figures cannot be expected to more than approximate the true condtion, but there can be no question as to the great improvement of the average per car tonnage, and if the per car loading of merchandise has shown no great improvement, and of this I am satisfied, the situation is certainly significant.

If conditions were otherwise normal, we would find that in the eastern territory, because of dense population and intense producticity, there is a heavier average loading per car for merchandise than is found in the West or South. Information as to the loading on representative western lines shows an average loading for merchandise cars from main terminals above 15,000 lbs. and relatively heavy loading from other points; while another large granger line shows an average of seven tons for 5,618 merchandise cars. One of the large southern lines shows loading from three terminal points 29,917 merchandise cars, average 12,874 lbs. Another southern line shows average merchandise loading at terminal points running seven, eight and up to 14 tons average. Still another southern line shows above 2,500 merchandise cars from one station with an average above 14,000 lbs.; from other points 683 cars average above 22,000; 1,355 cars average above 13,000 and 1,058 cars average above 14,500 lbs.

These figures only go to show, as might be expected, that with a greater number of any quantity ratings, the tonnage of merchandise cars would be greater, but this point is emphasized by the results shown in these sparsely settled territories.

The most marvelous development of traffic and railway earnings in the last decade has been in the southern and western territories. Am I mistaken in saying that seven out of eight of our leading eastern lines have western men at their heads, and it is to be supposed that they were all wrong in their western views and are all right in the eastern view? You may reply that these are questions of traffic rather than of operation, and that the preference for carload movements is eminently fitting for the eastern traffic situation. I would remind you that the root of the question is whether it is to the carriers' best interest to engage in retailing transportation or to hold out the carload rating as an inducement to the shipper to concentrate and handle freight in carload quantities.

It will be said, furthermore, that expense for terminal service is a fixed charge, that the proportion of terminal expense increases rapidly with the decrease in average rate, and that this will particularly affect the eastern lines, but this is as true with regard to carload as to less carload freight. It seems to me to be not entirely sound to figures that all of the elements that enter into the cost of transportation of less than carload shipments can be regarded as representing a saving by moving the freight in carloads. For instance, a large element in the expense of handling less than carload shipments is represented in the transfers and light car movements, in connection with distribution of freight in local trains; the carload movements do not in any material way displace the movement of less than carloads to local points. Carload freight, other than heavy commodities, moves most generally to the centers to which merchandise moves in through cars well loaded. Furthermore, the L. C. L. rating is presumptively made to cover the expenses incident to L. C. L. transportation.

The question as to what constitutes a common ground seems to be one of fact; given a general recognition of the commodity as being one entitled to a carload rating in any territory, it follows naturally that if there is a genuine carload movement of that commodity there should be continuance of the carload rating. There is no definite rule as to what constitutes a genuine carload movement, but we may hope that when a case now before the Supreme Court has been determined, we shall know more as to the carriers' rights; whether regulations may be made with the discriminating judgment and discernment characteristic of successful industry, or by the more stolid inflexible methods shown in governmental departments.

Pending this adjudication by the Supreme Court, I strongly adhere to the proposition that the carriers, having the right to make reasonable regulations, have not exceeded that right in requiring a common ownership as condition to carload ratings, when such regulation is necessary to protect the carriers from loss through collusion, generally instituted by persons not legitimately parties to the transportation transaction. Beyond ownership, the freight should, of course, be subject to one shipper, one consignee, and one bill of lading requirements. Necessity, rather than quantity, should determine the establishment of C. L. ratings; not whether goods are produced or can be offered for transportation in large aggregate quantities, but rather, whether the individual who finally says the freight is consuming the commodity so steadily as to make the item of freight charges thereon a matter of considerable concern to the public.

Obviously this would limit to L. C. L. ratings the articles which are in themselves rather the fruits than the instruments of industry. Articles that are traffic producers, such as fuel, raw materials, productive implements or machinery, building materials and goodstuffs, other than luxuries, should have pre-eminent consideration as C. L. commodities, and are generally so treated.

The determination of carload ratings on this basis will materially reduce the number now provided in the Official Classification, while it will generally increase the number in the Western and Southern Classifications. If because of territorial conditions such a carload rating is utterly repugnant to the lines in any territory, or if the carload movement is localized, between two manufacturers for instance, and not likely to be legitimately extended in other territories, there would seem to be no reason why the carload provision should not be taken care of by commodity issue as a substitute for the carload classification provision.

Those of you who have followed me through these devious paths have probably anticipated my arrival at the question of the mixed carload provisions of the several classifications. The Official Classification theory of carload ratings has its corollary in rule 10, which has been in the Official Classification since the first issue without material change. Rule 10 reads as follows:

"When a number of different articles of the same class are shipped at one time by one consignor to one consignee and destination, in carloads, they shall be taken at the rate of 100 lbs. for such class in carloads, and at the highest minimum carload weight provided for either of the articles, actual weight to be charged for if in excess of the minimum weight. If the articles (provided with L. C. L. and C. L. rating) are of more than one class, the carload weight and the minimum carload weight attaching to such rate for the articles in the highest class shall be charged on all the articles that make up the carload, actual weight to be charged for when in excess of the specified minimum weight, excepting as provided in Rule 7(A); and also excepting that where the actual or estimated weight of the articles in any one class equals or exceeds the minimum carload weight (actual weight if in excess of the minimum weight) and carload rate provided for same, and the other articles may be charged for at the L. C. L. class rate to which they belong."

Such a rule is the legitimate offspring of the theory that the carrier is the beneficiary in almost any movement of freight in carloads as compared with the movement of the same freight in smaller consignments. If the theory is sound it is difficult to see why the forwarding company, whose business and profit is in relieving the carrier of the concentration and distribution of merchandise, is not a genuine benefactor instead of the freight scalper and seller of illegal transportation that he is represented to be.

The Official Classification Rule represents a practice that differs materially from the Classification practice in the West and South.

From the standpoint of equity the rule is to be commended strongly, in that it is applied without discrimination and applies practically throughout the Classification. But so broad an application does not seemed to be called for by commercial considerations and insofar as it extends beyond commercial necessity it is obnoxious in principle to the Western and Southern Lines.

There seems to be no sound reason for including in the provisions for mixed carload ratings articles that are widely dissimilar in nature and rating, and if such articles are gathered and shipped in carloads, there may readily come in a freight rate adjustment that gives to certain shippers an undue if not unfair advantage over smaller competitors.

It would seem possible to somewhat restrict the application of this rule with mutual advantage and without material hardship to any legitimate traffic movement. The question as to what commercial necessity is comes to the front immediately and it is in the method of determining this that the danger of unwitting discrimination lies. It thus becomes the task for an expert, without bias, to determine what mixed carload ratings are justified by conditions, and to most men in the traffic world the qualification "without bias" would seem to be almost equivalent to being "without practical experience."

In such matters the classification should certainly be consistent within itself, and prejudice or territorial interest should not prevent the establishment of specific mixed C. L. ratings hitherto unrecognized, when articles produced and sold under similar conditions are under consideration. The Western and Southern Classifications have consistently opposed miscellaneous mixed car movements. Their theory seems to be that every rating represents within itself the satisfactory charge for the transportation represented and that no occasion exists for encouraging the shipper to perform terminal service at the carrier's expense; hence it is not the practice to provide carload ratings or provisions for the express purpose of encouraging shipments in carload quantities, and when carload ratings are provided they are supposed to represent a legitimate commercial necessity and a genuine carload movement.

If the suggestions set forth in the foregoing mark out the ground on which the territories can get together, then there can be in a uniform classification no room for a mixed carload rule such as Rule 10 of the Official Classification, nor can there be included therein any provision for carload ratings on articles that are not known to move in carload quantities. In the absence of a general rule providing for mixed carload ratings such mixtures as are commercially necessary would of necessity be provided for specifically. Likewise in the absence of proof of carload movement of many commodities now provided with carload ratings, such carload ratings would be discontinued.

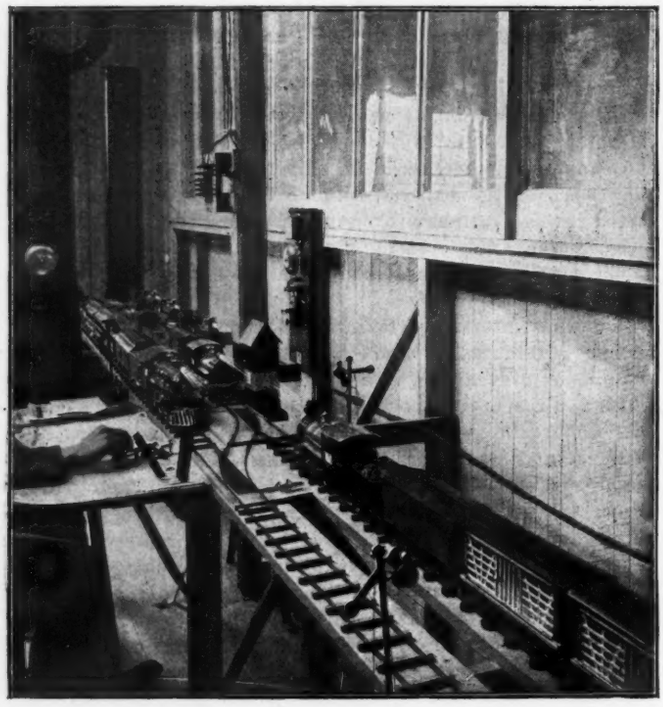
It has seemed to me necessary to place these differences in classification principles in sharp contrast. They must be recognized. Uniformity of classification can only be attained when these contrasts have been harmonized. The demand for Uniform Classification has come from the commercial interests. The carriers have responded, not sparing thought or expense. The carriers can bring the work to a successful issue with fair consideration for conflicting interests.

You shippers should be prepared to prove the genuineness of your interest in the work, by a spirit of conciliation within your own ranks; you should readily concede non-essentials, and take a liberal view as to what the essentials really are.

THE ELMIRA SCHOOL FOR STATION AGENTS.

The Railway Commercial Training School, 156 Lake street, Elmira, N. Y., is a complete establishment for giving young men the kind of schooling necessary to make them station agents, and it has been in successful operation for five years. On April 30 of this year the number of pupils in the school was 33, and the number enrolled since the beginning of the school is 262. The manager of the school is E. E. Tingley, and his principal assistant is L. J. Baird. The school is an independent establishment, but it is fostered by the Erie Railroad, and a large proportion of its graduates are now in service on that road. Mr. Tingley is an experienced train despatcher. Instruction is given in all of the different kinds of work that have to be done in the office of a "one man" railway station.

In learning telegraphy the student is established as in charge of an imaginary telegraph station on a short circuit, and, in addition to this, a train wire on which orders are



A Station on the Elmira & Southern Tier Railroad.

being constantly sent is run into the school so that students can be trained in copying actual messages.

Block signaling practice is taught by means of a miniature railway with actual trains propelled by electric motors, and there are crossover tracks, miniature signal cabins and other appliances to make the operations as nearly true to life as is practicable. The small signals along the line are so arranged that when cleared by the operator they turn on the power in the engine, and when set at stop they turn off the power so as to cause the stopping of the approaching train. Full size signals are also set up in the school room as object lessons. Pupils are taught to block from station to station by Morse telegraph, by telephone and by bell code.

In freight office work everything is done as for a station of an imaginary road the "Elmira & Southern Tier," and almost everything has an air of reality except the consignors and consignees. The principal guide is a manual prepared by E. W. McKenna and George B. Cochrane. Mr. McKenna is now a vice-president of the Chicago, Milwaukee & St. Paul, and Mr. Cochrane, now deceased, was formerly a vice-president of the Erie in charge of the traffic department. This manual opens with an introduction of about 20 pages, from which the novice can get a fair general idea of the whole philosophy of organizing, building and operating a railway. Following this, the duties of the agent are explained at length, the whole book filling 140 pages. Indeed, the first criticism that occurs to the reader is that there is a great deal of matter in the book which the young beginner either cannot fully comprehend or else, if he can comprehend it, will spend his time rather unprofitably in studying it. That is to say, there are many details which he will study with profit only after he needs them in actual work. This, however, is no detriment to the book so long as the teaching is in the hands of one who rightly guides the pupil.

Lectures are given occasionally by a railway officer.

In all of the freight office and ticket office work the students are required to carry on actual transactions as much as possible. Regular ticket cases are provided and sales are made. School "money" is used as in ordinary business colleges, and cash accounts must be balanced as rigidly as in real life. The student is drilled daily for about three months in the proper method of dealing with freight forwarded and freight received, so that he becomes familiar with all of the usual blanks.

Pupils may enter the school at any time, and the teachers calculate usually to graduate them in six months, though sometimes a longer time is required. No vacations are provided for. The entrance requirements are rigid, as the manager has no desire to spend his time on pupils who are not likely to graduate. All who complete the course satisfactorily are offered positions at stations.

The average age of the students is from 17 to 21 years, though suitable candidates are accepted between 17 and 25 years. There are generally a few young women in the school and a good number of these have made satisfactory station agents. The tuition for the complete course is $30, which includes all necessary stationery and other supplies. In many cases graduates who complete their work at a time when there is no opening exactly suited to them, take a post graduate course of four to eight weeks as assistant to the agent, at a small station, and are paid at the rate of $25 a month while thus learning. If there is an opening for an assistant at a station where an assistant is regularly employed the graduate may stay much longer than six weeks, or until he can be promoted.

Total number of students thus far taught in the school, as before stated, is 262. The details are as follows:

In railway service	133
Left school before finishing course	58
Left railway service after being appointed	38
In school April 30	33
Total	262

Graduates are now in the service of the Erie, the Delaware, Lackawanna & Western, the Pennsylvania, the Lehigh Valley, the Buffalo & Susquehanna, the Delaware & Hudson, the New York Central, the Central of New Jersey, and other roads.

The illustration shows one of the stations on the miniature railway in the school. The train on the main track nearest the operator is westbound passenger train No. 3. A westbound freight has been set off on the eastbound track to clear the road for No. 3. Two trains consisting each of an engine and a caboose, and a third, consisting of an engine only, are standing on the side track east of the station and south of the main line. The eastbound freight is held by the home signal in the center of the picture. The toy semaphores shown in the illustration were made in Germany. Since this view was taken these have been superseded by signals of home manufacture.

The Danish railways have done away with the first-class on all trains except those which connect with foreign trains. An examination of the earnings of the different classes of cars has shown that, for the same capacity, the first-class cars earn less than two-fifths as much as the second and third-class cars.

TRACK-LAYING MACHINE RESULTS.

The Erie & Jersey, a low-grade freight line built by the Erie Railroad, extends from Guymard, N. Y., to Highland Mills. In order to insure operation by January 1, 1909, and for economy, it was decided to use a track-laying machine. The grading was far enough advanced to allow the track-laying to start in the latter part of August. This gave a limit of four and a half months in which to lay and ballast two tracks over 40 miles of line. The Hurley machine (*Railroad Gazette*, March 13, 1908) was used, and we are indebted to C. K. Conard, assistant engineer, for the following:

After many trials with fewer men, it was found that the best results were obtained with 50 men, working as follows:

1 General foreman.
1 Foreman.
1 Lineman stretching a light rope at proper offset distance from center line.
2 Tie spacers.
1 Tie marker, placing marks on ties so that center of tie will be set midway between rails.
1 Clamp man, applying hoisting clamp to rails before lowering.
1 Clamp man on ground disengaging hoisting clamp and steadying rail.
8 Spikers, four to each rail.
4 Nippers, two to each rail.
2 Bolters, one to each rail.
1 Clamper, holding angle bars for bolts.
2 Barmen, holding rail to gage.
1 Spike peddler.

25 Total in front of wheels of machine.

1 Engineer, in charge of the machine.
1 Assistant, working rail conveyor, as rails leave the friction rolls.
1 Bolter, removing bolts as rails leave the roll.
1 Fireman.
1 Watchman (night).
2 Feeding ties to dogs at rear of machine.

7 Total on machine.

2 Breaking out ties.
8 Spacing ties.
1 Watching and guiding ties.

11 Total attending to the ties.

1 At rear hoist.
1 Advancing rails on rollers.
2 Placing angle bars, and one bolt on front end of rail.
2 Bolting to forward rails.
1 Tightening bolts.

7 Total feeding the rail.

Cost of Laying Track.—Nearly all of the second track on the Erie & Jersey was laid by hand. As most railway companies are familiar with this cost on their own line, it seems advantageous to compare it with the cost of the first track in order to give a correct idea of what the cost with the machine would be under the same conditions.

With a machine laying a mile per day the cost was as follows:

Laying Track by Machine.

1 General foreman at $5.00			$5.00
1 Engineer at $5.00			5.00
1 Fireman at $2.25			2.25
1 Foreman at $3.50			3.50
50 Laborers at $1.50			75.00
1 Watchman (night), at $2.25			2.25
Machine, coal and oil			30.00
Full bolting and spiking after passage of machine:			
1 General foreman at $5.00			$5.00
1 Foreman at $3.50			3.50
50 Laborers at $1.50			75.00
Loading material—ties:			
1 Foreman at $3.00			3.00
35 Laborers at $1.50			52.50
Engine and crew			35.00
Rails and fastenings:—			
1 Foreman at $2.00		$2.00	
20 Laborers at $1.50		30.00	
Total		$32.00	
6,963 lin. ft. of rail and fastenings loaded.			
This gives per mile of track		$48.53	
Engine and crew		35.00	
Total rail and fastenings			$83.53
Total per mile of track			$380.53

Laying Second Track by Hand.

Spacing ties, spiking and full bolting 3,000 ft.:			
2 Foremen at $3.00		$6.00	
74 Laborers at $1.50		111.00	
Total		$117.00	
Per mile			$205.92
Loading ties:—			
1 Foreman at $3.00	$3.00		
35 Laborers at $1.50	52.50		
		$55.50	
Unloading ties:			
1 Foreman at $3.00	$3.00		
6 Laborers at $1.50	9.00		
		12.00	
Engine and crew		35.00	
			$102.50
Loading rail and fastenings, same as for machine			48.53
Unloading rail and fastenings:			
2 Foremen at $2.00		$4.00	
28 Laborers at $1.50		42.00	
Total		$46.00	
Above worked four hours		18.40	18.40
Total per mile of track			$375.53

It should be realized, of course, that these figures do not represent the cost of continuing the work day by day; but they are representative figures for each class of work under similar conditions. The cost of laying the first track of a double track railway by hand is variable, depending largely on the accessibility of the roadbed for teams, as the ties are usually transferred from the tie car to the front by this means. The second track should be laid at a fairly regular cost.

So far as the track laid by machine is concerned, it is not possible at this date to determine which track was so laid. When laying down grade there is a tendency to open the joints. Clips for the proper temperature expansion are a necessity. From the experience with the machine the following may be accepted: (1) On a new line 25 miles long, or more, the machine will prove economical. (2) The track laid with the machine will be as satisfactory as track laid by hand. (3) The organization will be reduced in number by 150 to 200 men. (4) It is feasible to lay one mile of track per day up to a limit of 12 or 15 miles from the supply base. (5) The danger of injury to men is largely reduced.

BLOCK SIGNAL MILEAGE JANUARY 1.

The Interstate Commerce Commission has issued its bulletin showing the mileage of railways in the United States worked by the block system on January 1, 1910. As in former years the bulletin contains, besides the principal table, which we reprint herewith, other tables, No. 2, No. 3 and No. 4, showing the kinds of automatic signals in use and the methods and apparatus used with the manual block system. By reason of lack of space these supplementary tables must be deferred to a future issue.

The total length of road in the United States operated under the block system on January 1, 1910, was 65,758 miles. Of this mileage, 14,237.7 was automatic and 51,520.3 was manual. There was an increase of 2,047.1 miles in the length of road covered by the automatic block system, and of 4,162.2 miles in the manual system, over January 1, 1909; total increase, 6,209.3 miles.

The present report contains the following roads which have not heretofore reported block signals: Chicago, Indianapolis & Louisville; Cincinnati, Indianapolis & Western; Cincinnati Northern (New York Central Lines); Elgin, Joliet & Eastern;

Name of railroad.	Increase.		Decrease, non-automatic.
	Automatic.	Non-automatic.	
Baltimore & Ohio		116.0	
Baltimore & Ohio Southwestern		914.4	
Boston & Maine	180.1		
Chicago & Alton	248.6		248.6
Chicago & North Western	115.8		
Chicago, Milwaukee & Puget Sound		453.3	
Chicago, Rock Island & Pacific	335.1	733.1	
Delaware, Lackawanna & Western	57.0		
Lake Erie & Western (see note)		853.2	
Maine Central	128.7		
Minneapolis, St. Paul & Sault Ste. Marie		193.6	
New York Central & Hudson River	62.9		55.8
New York, New Haven & Hartford			102.1
Norfolk & Western	71.3		150.3
Northern Pacific	39.8	110.7	
Pennsylvania Company	89.2		89.0
St. Louis & San Francisco	129.8		112.0
Southern		235.8	
Galveston, Harrisburg & San Antonio (Southern Pacific)	125.3		
Southern Pacific—Pacific system	177.6		
Union Pacific	85.5		
Oregon Short Line	40.3		

Principal Changes of the Year.

RAILWAYS WORKED BY THE BLOCK SYSTEM, JAN. 1, 1910.—(*See next page.*)

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and non-automatic.		Total passenger lines operated.		Percentage block signaled (miles of track).
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Atchison, Topeka & Santa Fe:																	
Eastern Lines	4.5	45.4			49.9	95.3	437.2	427.6	12.9		877.7	1,331.1	927.6	1,426.4	2,521.6	3,024.0	47.0
Western Lines	33.4	2.4			35.8	38.2	541.8	23.9			565.7	589.6	601.5	627.8	2,681.2	2,707.5	23.2
Coast Lines	12.9	1.0			13.9	14.9	4.3				4.3	4.3	18.2	19.2	1,751.9	1,754.0	1.1
Gulf, Colorado & Santa Fe	10.8				10.8	10.8	2.1				2.1	2.1	12.9	12.9	1,401.7	1,401.7	.6
Atlanta & West Point							81.0	6.0			87.0	93.0	87.0	93.0	87.0	93.0	100.0
Atlantic Coast Line		2.2			2.2	4.4	395.0	92.8			487.8	580.6	490.0	585.0	3,825.7	4,568.1	12.8
Baltimore & Ohio	16.2	168.5		4.6	189.3	371.5	305.0	596.6	87.0	14.9	1,003.5	1,818.7	1,192.8	2,190.2	3,143.3	4,212.7	38.0
Baltimore & Ohio Southwestern							922.6	49.0		2.2	973.8	1,029.7	973.8	1,029.7	973.8	1,029.7	100.0
Baltimore & Sparrows Point								3.0			3.0	6.0	3.0	6.0	4.7	9.4	63.8
Bessemer & Lake Erie							90.6	104.5			195.1	299.6	195.1	299.6	188.3	292.8	99.0
Boston & Maine	4.5	536.3	0.5	2.1	543.4	1,086.9		4.8			4.8	9.6	548.2	1,096.5	2,238.6	2,801.6	39.2
Boston, Revere Beach & Lynn		13.8			13.8	27.6							13.8	27.6	13.8	27.6	100.0
Buffalo, Rochester & Pittsburgh							297.9	124.1			422.0	546.2	422.0	546.2	422.0	546.2	100.0
Butte, Anaconda & Pacific	7.9				7.9	7.9							7.9	7.9	25.7	25.7	30.7
Caldwell & Northern							2.4	2.4			2.4	2.4	2.4	2.4	23.4	23.4	10.3
Central of Georgia							52.3	7.4			59.7	67.1	59.7	67.1	1,915.9	1,915.9	3.5
Central of New Jersey	13.0	165.5	2.4	31.5	212.4	477.2							212.4	477.2	469.7	748.6	62.8
Central Vermont							1.5				1.5	1.5	1.5	1.5	403.3	403.3	.4
Chesapeake & Ohio		48.1			48.1	96.2	1,208.6	256.1			1,464.7	1,735.7	1,512.8	1,831.9	1,527.1	1,856.2	98.7
Coal River							69.3				69.3	69.3	69.3	69.3	69.3	69.3	100.0
Chicago & Alton	416.1	144.9			561.0	705.9	141.2				141.2	141.2	702.2	847.1	998.9	1,143.0	74.1
Chicago & Eastern Illinois		98.4			98.4	196.8	163.8	57.5			221.3	278.8	319.7	475.6	693.0	849.5	56.0
Chicago & North Western		706.4	13.1	2.4	721.9	1,461.7	2,415.5	115.3			2,530.8	2,646.1	3,252.7	4,107.8	6,874.5	7,774.2	47.3
Chicago & Western Indiana		17.8			17.8	35.6		6.3	3.2		9.5	22.2	27.3	57.8	27.3	57.8	100.0
Chicago, Burlington & Quincy		23.0		5.0	28.0	66.0	8,152.5	502.2	19.1	1.4	8,675.2	9,219.8	8,703.2	9,285.8	8,272.5	8,855.1	100.0
Chicago Great Western	.2	7.9			8.1	16.0	264.2	26.8			291.0	317.8	299.1	333.8	1,473.7	1,508.6	22.1
Chicago, Indianapolis & Louisville							537.7				537.7	537.7	537.7	537.7	578.0	578.0	93.0
Chicago, Milwaukee & St. Paul	5.9	42.6			48.5	91.1	3,486.7	385.4			3,872.1	4,257.5	3,920.6	4,348.6	6,550.2	7,266.0	58.4
Chicago, Milwaukee & Puget Sound							1,076.0				1,076.0	1,076.0	1,076.0	1,076.0	1,399.8	1,399.8	76.8
Chicago, Peoria & St. Louis Ry. of Ill	1.2				1.2	1.2							1.2	1.2	226.9	226.9	.5
Chicago, Rock Island & Pacific	319.9	279.6			599.5	879.1	1,151.8				1,151.8	1,151.8	1,751.3	2,030.9	7,554.9	8,018.9	25.3
Chicago, St. Paul, Minneapolis & Omaha		6.4			6.4	12.8	585.5	64.1			649.6	713.7	656.0	726.5	1,478.5	1,563.8	46.8
Chicago Terminal Transfer	.8	5.4			6.2	11.6							6.2	11.6	45.8	66.9	17.3
Cincinnati, Hamilton & Dayton		7.5			7.5	15.0	31.2	20.4			51.6	72.0	59.1	87.0	448.0	481.0	18.1
Cincinnati, Indianapolis & Western							41.8				41.8	41.8	41.8	41.8	381.0	381.0	11.0
Colorado Midland							2.0				2.0	2.0	2.0	2.0	254.6	254.6	.8
Cornwall & Lebanon							8.3	13.7			22.0	35.7	22.0	35.7	22.0	35.7	100.0
Cumberland & Pennsylvania							4.3		3.0		7.3	13.3	7.3	13.3	31.3	34.8	38.2
Cumberland Valley		6.7			6.7	13.4	19.6				19.6	19.6	26.3	33.0	162.2	203.7	16.2
Davenport, Rock Island & Northwestern							40.6	1.1			41.7	42.8	41.7	42.8	41.7	42.8	100.0
Delaware & Hudson	163.6	222.2	4.3	17.5	407.6	690.9	.6				.6	.6	408.2	691.5	743.9	1,042.4	66.4
Delaware, Lackawanna & Western	52.1	473.9	6.2		532.2	1,018.5	5.8				5.8	5.8	538.0	1,024.3	922.1	1,421.6	72.0
Duluth & Iron Range							14.8	2.0			16.8	18.8	16.8	18.8	168.0	240.0	8.3
Duluth, South Shore & Atlantic							4.2				4.2	4.2	4.2	4.2	593.4	593.4	.7
Durham & Southern							56.0				56.0	56.0	56.0	56.0	56.0	56.0	100.0
Elgin, Joliet & Eastern	1.0	3.0			4.0	7.0	9.2				9.2	9.2	13.2	16.2	223.9	269.8	4.9
Erie		62.0		13.6	75.6	178.4	643.5	581.5			1,225.0	1,806.5	1,300.6	1,984.9	2,110.8	2,276.2	86.0
Chicago & Erie							240.4	8.4			248.8	257.2	248.8	257.2	248.8	257.2	100.0
Columbus & Erie							12.6	9.8			22.4	32.2	22.4	32.2	22.4	32.2	100.0
Erie & Jersey		42.3			42.3	84.6							42.3	84.6	Freight line.		
New Jersey & New York		10.5			10.5	21.0	26.1				26.1	26.1	36.6	47.1	51.8	61.3	76.6
New York, Susquehanna & Western and Wilkes-Barre & Eastern							20.7				20.7	20.7	20.7	20.7	208.4	208.4	9.9
Grand Trunk	1.1	1.6			2.7	4.3							2.7	4.3	686.6	1,014.9	.4
Great Northern	8.2	62.0			70.2	132.2	259.7				259.7	259.7	329.9	391.9	7,100.0	7,263.4	5.4
Hocking Valley							74.7				74.7	74.7	74.7	74.7	336.4	385.2	19.4
Illinois Central	28.6	235.1		12.0	275.7	585.5		5.0			5.0	10.0	280.7	595.5	4,122.0	4,996.5	.1
Yazoo & Mississippi Valley	6.6				6.6	6.6							6.6	6.6	1,191.7	1,299.4	.5
Iowa Central							11.0				11.0	11.0	11.0	11.0	502.3	502.3	.2
Kanawha & Michigan	.8				.8	.8	1.3				1.3	1.3	2.1	2.1	162.9	162.9	1.2
Kansas City, Clinton & Springfield							2.5				2.5	2.5	2.5	2.5	156.7	156.7	1.6
Kentucky & Indiana Bridge & R. R. Co							5.6	3.4	.7		9.7	14.6	9.7	14.6	9.7	14.6	100.0
Lackawanna & Wyoming Valley							1.0	2.4			3.4	5.8	3.4	5.8	22.6	43.4	13.4
Lehigh & New England	.7				.7	.7							.7	.7	156.7	156.7	.4
Lehigh Valley	14.1	421.2	34.6	11.1	481.0	1,004.6	675.0	60.6			735.6	796.1	1,216.6	1,800.7	1,180.6	1,728.0	100.0
Long Island	4.0	80.7	3.3	3.7	91.7	190.1		22.7			22.7	45.4	114.4	235.5	391.9	549.5	43.0
Louisville & Nashville	32.9	19.3			52.2	71.5	167.4	48.9			216.3	265.2	268.5	336.7	4,048.0	4,399.4	7.6
Maine Central	274.1	45.7			319.8	365.5							319.8	365.5	907.7	959.5	38.1
Marquette & Southeastern							3.7				3.7	3.7	3.7	3.7	50.8	50.8	7.3
Minneapolis, St. Paul & Sault Ste. Marie							2,181.3	4.4			2,185.7	2,190.1	2,185.7	2,190.1	3,095.2	3,099.6	70.6
Missouri, Kansas & Texas	3.0				3.0	3.0	8.6				8.6	8.6	11.6	11.6	3,072.0	3,072.0	.4
Missouri Pacific	43.0	17.7			60.7	78.4	27.1	7.0			34.1	41.1	94.8	119.5	3,676.2	3,724.1	3.2
St. Louis, Iron Mountain & Southern	84.3	8.6			92.9	101.5	6.8	1.1			7.9	9.0	100.8	110.5	2,536.6	2,592.0	4.3
Mississippi Central							150.0				150.0	150.0	150.0	150.0	150.0	150.0	100.0
Mobile & Ohio		4.7			4.7	9.5	42.4				42.4	42.4	47.1	51.9	825.0	825.0	9.6
Monongahela	.5				.5	.5							.5	.5	48.0	66.3	.8
Nashville, Chattanooga & St. Louis							92.8	10.3			103.1	113.4	103.1	113.4	1,230.1	1,240.4	9.1
Newburgh & South Shore							.1	5.2			5.3	10.5	5.3	10.5	Freight line.		
New York & Long Branch		38.0			38.0	76.0							38.0	76.0	38.0	76.0	100.0
New York Central Lines:																	
Boston & Albany		164.3	21.1	21.5	206.9	477.7		1.6			1.6	3.2	208.5	480.9	376.3	648.7	74.1
Chicago, Indiana & Southern		5.0			5.0	10.0	17.4				17.4	17.4	22.4	27.4	313.0	346.6	7.8
Cincinnati Northern							206.1				206.1	206.1	206.1	206.1	206.1	206.1	100.0
Cleveland, Cincinnati, Chicago & St. Louis							549.0	318.4			867.4	1,185.8	867.4	1,185.8	1,762.6	2,099.4	56.5
Lake Erie & Western							862.8	9.0			871.8	880.8	871.8	880.8	832.4	841.4	100.0
Lake Shore & Michigan Southern	6.9	256.9	99.5	157.1	520.4	1,447.6	1,033.6	21.1			1,054.7	1,075.8	1,575.1	2,523.4	1,450.6	2,398.2	100.0
Dunkirk, Allegheny Valley & Pittsburgh							90.3				90.3	90.3	90.3	90.3	90.3	90.3	100.0
Lake Erie, Alliance & Wheeling							87.7				87.7	87.7	87.7	87.7	87.7	87.7	100.0
Michigan Central		271.9			271.9	543.9	901.1	19.1			920.2	939.3	1,192.1	1,483.2	1,192.1	1,483.2	100.0
New York Central & Hudson River		152.8		56.0	208.8	529.6	1,715.1	627.0	25.1	264.3	2,631.5	4,101.8	2,840.3	4,631.4	2,853.5	4,644.5	99.7
Peoria & Eastern							3.6	1.7			5.3	7.0	5.3	7.0	337.9	339.6	.2
Pittsburgh & Lake Erie		106.5	4.9	37.4	148.8	377.3	19.8	2.9			22.7	25.6	171.5	402.9	183.9	406.1	98.9
New York, New Haven & Hartford	20.5	235.8			256.3	492.1	155.4	208.9		75.8	440.1	876.4	696.4	1,368.5	1,899.4	2,901.0	47.2
New York, Ontario & Western	36.0	109.7			145.7	255.4							145.7	255.4	492.8	621.3	41.1
Norfolk & Western	4.1	134.2			138.3	272.5	1,345.1	161.7			1,506.8	1,668.5	1,645.1	1,941.0	1,719.3	2,003.6	95.1
Northern Pacific	1.5	57.7			59.2	116.9	1,068.6	321.6			1,390.2	1,711.8	1,449.4	1,828.7	4,994.1	5,448.0	33.5
Northwestern Pacific	2.5	11.4			13.9	25.3	250.5				250.5	250.5	264.4	275.8	330.6	342.0	80.6
Pennsylvania		58.6	3.0	184.2	245.8	871.4	1,320.0	707.8	35.0	192.4	2,255.2	3,597.2	2,501.0	4,468.6	3,232.0	5,239.9	85.4
Cleveland, Akron & Columbus							126.5	15.6			142.1	157.7	142.1	157.7	177.8	195.8	80.5
Cincinnati & Muskingum Valley							11.4				11.4	11.4	11.4	11.4	148.4	148.4	7.7
Grand Rapids & Indiana								2.2			2.2	4.4	2.2	4.4	436.5	444.6	1.0
Northern Central							287.5	119.8		21.3	428.6	612.3	428.6	612.3	439.7	635.6	96.3
Pennsylvania Company		173.0	26.0	41.7	240.7	590.8	200.4	425.2	3.0		628.6	1,059.8	869.3	1,650.6	1,314.4	2,111.1	78.4
Philadelphia, Baltimore & Washington		15.6		21.0	36.6	115.2	107.3	147.1	17.1	14.6	286.1	511.2	322.7	626.4	639.4	945.5	66.2
Pittsburgh, Cincinnati, Chicago & St. Louis		7.2		2.1	9.3	22.8	610.5	397.4	43.8	17.8	1,069.5	1,607.9	1,078.8	1,630.7	1,416.3	2,030.1	84.7
West Jersey & Seashore		87.7	6.3		94.0	194.3	46.2	33.5			79.7	113.2	173.7	307.5	318.2	455.6	67.5

RAILWAYS WORKED BY THE BLOCK SYSTEM, JAN. 1, 1910.—*(Continued; also See Notes at Bottom of Table.)*

Names of railroads.	Automatic block signals.						Nonautomatic block signals.						Total automatic and non-automatic.		Total passenger lines operated.		Percentage block signaled (miles of track).
	Single track.	Double track.	Three track.	Four track.	Total. Miles of road.	Total. Miles of track.	Single track.	Double track.	Three track.	Four track	Total. Miles of road.	Total. Miles of track.	Miles of road.	Miles of track.	Miles of road.	Miles of track.	
Peoria & Pekin Union								6.0			6.0	12.0	6.0	12.0	15.4	24.6	48.8
Pere Marquette	12.9				12.9	12.9	19.0				19.0	19.0	31.9	31.9	1,537.0	1,544.2	2.1
Philadelphia & Reading	6.3	285.7	39.6	15.9	347.5	760.1	156.4	122.0			278.4	400.4	625.9	1,160.5	874.4	1,440.0	80.6
Atlantic City		86.9			86.9	173.8	22.6				22.6	22.6	109.5	196.4	163.6	251.6	78.1
Northeast Pennsylvania	2.9	1.8			4.7	6.5	1.7				1.7	1.7	6.4	8.2	25.5	27.3	30.0
Perkiomen							38.1				38.1	38.1	38.1	38.1	38.1	38.1	100.0
Philadelphia, Newton & New York	4.1	1.9	1.5		7.5	12.4							7.5	12.4	21.7	26.6	46.6
Reading & Columbia							35.7				35.7	35.7	35.7	35.7	53.2	53.2	67.1
Queen & Crescent Route:																	
Alabama Great Southern	91.7	.4			92.1	92.5							92.1	92.5	290.5	294.8	31.7
Cincinnati, New Orleans & Texas Pacific	265.2	69.9			335.1	405.0	.7				.7	7	335.8	405.7	335.8	405.7	100.0
Richmond, Fredericksburg & Potomac							9.7	78.0			87.7	165.7	87.7	165.7	87.7	175.4	100.0
St. Joseph & Grand Island							.3				.3	.3	.3	.3	251.6	251.6	
St. Louis & San Francisco	138.6	32.7			171.3	204.0	275.6	4.1			279.7	283.8	451.0	487.8	4,726.6	4,763.4	10.2
St. Louis Merchants' Bridge Terminal		5.9			5.9	11.8		1.1			1.1	2.2	7.0	14.0	9.9	19.8	70.7
St. Louis Southwestern	.4				.4	.4							.4	.4	621.5	621.5	
San Pedro, Los Angeles & Salt Lake	1.1				1.1	1.1							1.1	1.1	403.2	403.2	.2
Seaboard Air Line							213.5				213.5	213.5	213.5	213.5	2,739.1	2,739.1	.1
Southern		3.0			3.0	6.0	1,594.7	239.7			1,834.4	2,074.1	1,837.4	2,080.1	6,647.8	6,942.0	30.0
Southern Illinois & Missouri Bridge		4.6			4.6	9.2							4.6	9.2	4.6	9.2	100.0
Southern Pacific, Atlantic System:																	
Galveston, Harrisburg & San Antonio	215.3				215.3	215.3							215.3	215.3	1,270.5	1,274.9	16.9
Louisiana Western	103.6				103.6	103.6							103.6	103.6	140.3	140.3	73.9
Morgan's Louisiana & Texas	95.3				95.3	95.3							95.3	95.3	241.9	282.1	33.9
Texas & New Orleans	109.8				109.8	109.8							109.8	109.8	438.5	441.9	24.9
Southern Pacific: Pacific System	1,939.1	135.1		1.0	2,075.2	2,213.3	95.4				95.4	95.4	2,170.6	2,308.7	6,343.6	6,493.2	35.5
Staten Island Rapid Transit		10.0			10.0	20.0							10.0	20.0	10.0	20.0	100.0
Spokane, Portland & Seattle							5.4	3.0			8.4	11.4	8.4	11.4	405.6	408.6	2.8
Terminal Railroad Association of St. Louis		6.0			6.0	12.0		1.1			1.1	2.2	7.1	14.2	12.7	25.5	55.7
Ulster & Delaware	24.4				24.4	24.4							24.4	24.4	126.3	126.3	19.8
Union		.6			.6	1.2	1.4				1.4	1.4	2.0	2.6	7.4	14.8	17.9
Union Pacific	846.6	459.2		1.7	1,307.5	1,769.8	10.9				10.9	10.9	1,318.4	1,780.7	3,415.9	3,919.4	45.4
Oregon R. R. & Navigation Co.	415.7				415.7	415.7							415.7	415.7	1,309.1	1,309.1	31.7
Oregon Short Line	367.3	6.9			374.2	381.1							374.2	381.1	1,473.2	1,480.1	25.7
Vandalia							199.8	38.1			237.9	275.9	237.9	275.9	797.0	843.4	32.6
Virginia & Kentucky							.6				.6	.6	.6	.6	4.8	4.8	12.5
Virginian							2.2				2.2	2.2	2.2	2.2	Freight line.		
Wabash		7.2			7.2	14.4	1,726.7	94.0			1,820.7	1,914.7	1,827.9	1,929.1	1,954.9	2,056.1	93.8
Wabash Pittsburg Terminal		4.1			4.1	8.2							4.1	8.2	59.8	63.9	12.8
Washington Southern								32.2			32.2	64.3	32.2	64.3	32.2	64.3	100.0
Washington Terminal		1.1		1.0	2.1	20.4							2.1	20.4	2.1	20.4	100.0
Western Ry. of Alabama							138.0				138.0	138.0	138.0	138.0	138.0	138.0	100.0
Total	6,277.7	7,049.6	266.3	644.1	14,237.7	23,811.4	42,843.5	7,822.2	249.9	604.7	51,520.3	61,658.4	65,758.0	85,484.0	162,526.3	189,512.6	

Bessemer & Lake Erie. These figures include 8.9 miles of road on which no passenger trains are run.
Chicago, Burlington & Quincy.—The single track non-automatic mileage includes 652.1 miles of road on which only one engine is in service.
Lake Erie & Western. Includes Fort Wayne, Cincinnati & Louisville and Northern Ohio; 34 miles used only for freight traffic.
Michigan Central. 243.1 miles double track automatic in Canada not shown in this table.

Kanawha & Michigan, Lehigh & New England; Mississippi Central; Spokane, Portland & Seattle; Virginia & Kentucky; Western Railway of Alabama.

In table 1 the percentage of block-signaled mileage to the total passenger mileage operated is computed on track mileage instead of road mileage, as in previous reports. In computing the number of automatic block sections (Table 2) the unit is the distance from the home signal at the entrance of a section to the home signal which marks the beginning of the next block section. Where there are two or more main tracks the sections are counted separately for each track. The principal changes of the year (miles of road) are shown, page 1339.

The bulletin contains also a list of roads on which telephones are used in transmitting train orders, from which it appears that this means of communication for this purpose is now in use on 26,344 miles of road. We copy from this table the figures concerning all of the roads shown which operate 100 miles or more of line. This table contains nearly 300 roads, and a large proportion of it is made up of names of very short roads,

Railway Lines on Which the Telephone Is Used for the Transmission Train Orders.

Names of railways.	Telephone. Miles of road	Total operated. Miles of road
Atchison, Topeka & Santa Fe:		
Eastern lines	1,412	5,564
Coast lines	393	1,908
Gulf, Colorado & Santa Fe	193	1,518
Santa Fe, Prescott & Phoenix	6	364
Texas & Gulf	96	96
Atlantic Coast Line	139	4,181
Baltimore & Ohio	20	3,474
Boston & Maine	51	2,294
Chesapeake & Ohio	135	1,703
Chicago & North Western	551	7,638
Chicago, Burlington & Quincy	2,437	8,948
Chicago, Milwaukee & St. Paul	337	7,481
Chicago, Milwaukee & Puget Sound	635	1,462
Chicago, Rock Island & Pacific	642	7,393
Chicago, Rock Island & Gulf	48	530
Coal & Coke	191	191
Cumberland Valley	54	162
Delaware, Lackawanna & Western	900	957
Denver & Rio Grande	32	2,598
Boca & Loyalton	45	45
Detroit & Mackinac	70	263
Duluth & Iron Range	168	169
Erie	146	1,869
Escanaba & Lake Superior	80	142
Georgia & Florida	80	284
Great Northern	1,511	6,536
Illinois Central	1,076	4,577
Omaha Bridge & Terminal	10	24
Kansas City, Clinton & Springfield	3	155
Lehigh & New England	90	170
Lehigh Valley	159	1,394
Louisville & Nashville	251	4,598
Nevada-California-Oregon	27	224
Sierra Valleys	37	37
New Orleans, Mobile & Chicago	7	401
Newton & Northeastern:		
Fort Dodge, Des Moines & Southern	200	200
New York Central lines:		
Cleveland, Cincinnati, Chicago & St. Louis	110	1,848
Chicago, Kalamazoo & Saginaw	56	56
Detroit & Charlevoix	43	52
Fulton Chain	2	2
Lake Shore & Michigan Southern	255	1,575
Lake Erie, Alliance & Wheeling	88	88
Little Falls & Dolgeville	2	14
Michigan Central	757	1,792
New York Central & Hudson River	497	3,195
New York, Chicago & St. Louis	132	523
New York, New Haven & Hartford	11	2,003
Norfolk & Southern	97	592
Norfolk & Western	210	1,942
Northern Pacific	597	5,698
Northwestern Pacific	117	408
Ohio Electric	242	242
Ohio River & Columbus	24	24
Pennsylvania	1,126	5,299
Grand Rapids & Indiana	8	592
New York, Philadelphia & Norfolk	16	112
Philadelphia, Baltimore & Washington	11	694
Waynesburg & Washington	29	29
Wheeling Terminal	5	10

Names of railways.	Telephone.	Total operated.
	Miles of road	
Philadelphia & Reading	28	1,099
Williams Valley	8	11
Pittsburgh, Shawmut & Northern	29	230
Sandy River & Rangeley Lakes	78	105
Seaboard Air Line	149	2,987
Southern Pacific (Pacific system)	292	6,112
Corvallis & Eastern	21	140
Spokane & Inland Empire	165	178
Union Pacific	123	3,384
Oregon Short Line	49	1,509
Virginian	470	472
Wabash:		
Wabash-Pittsburg Terminal	4	64
Wheeling & Lake Erie	6	442
Wisconsin & Michigan	8	128

of light traffic, many of which probably never had a telegraph line.* Where the whole length of line operated by a railway is greater than the length of line operated with the telephone it is assumed that on the balance of the mileage the Morse telegraph is used.

TRAIN ACCIDENTS IN APRIL.[1]

Following is a list of the most notable train accidents that occurred on the railways of the United States in the month of April, 1910. This record is intended to include usually only those accidents which result in fatal injury to a passenger or an employee or which are of special interest to operating officers. It is based on accounts published in local daily newspapers, except in the case of accidents of such magnitude that it seems proper to write to the railway manager for details or for confirmation:

Collisions.

Date.	Road.	Place.	Kind of Accident.	Kind of Train.	No. persons reported Kil'd.	Inj'd.
7.	Louis. & Nash.	Saxton.	xc.	P. & Ft.	1	2
7.	Georgia	Berzelia.	bc.	Ft. & Ft.	2	5
8.	Balt. & Ohio	Triadelphia.	bc.	Ft. & Ft.	1	4
8.	N. Y. Central.	Rome.	rc.	Ft. & Ft.	1	..
9.	Nor. Pacific	Spokane.	bc.	P. & P.	0	30
*10.	Balt. & Ohio	Fetterman.	rc	P. & Ft.	1	4
11.	C., R. I. & P.	Garrison.	....	P. & Ft.	1	14
20.	Penn.	Pittsburgh.	xc.	P. & P.	0	11
22.	C.,C.,C. & St.L.	Sanford.	xc.	P. & Ft.	3	8
28.	West. Pac.	Chalona, Nev.	bc.	Ft. & Ft.	0	3
30.	Ill. Cent.	Chicago.	rc.	P. & Ft.	0	2

Derailments.

Date.	Road.	Place.	Cause of derlmt.	Kind of train.	No. persons reported Kil'd.	Inj'd.
1.	Norf. & West.	Watts Tank.	unx.	Pass.	1	1
8.	N. Y. Central.	Rome	acc. obst.	Pass.	0	20
8.	Trinity & B. V.	Corsicana.	washout.	Ft.	1	1
14.	Nor. Pacific	Spokane.	b. wheel.	Ft.	4	7
16.	Balt. & Ohio	Clarion.	unx.	Ft.	4	0
*18.	Ill. Cent.	Jackson.	malice.	Pass.	4	4

The butting collision at Seventh avenue, Spokane, Wash., on the evening of the ninth, was between eastbound and westbound passenger trains of the Spokane, Portland & Seattle, which run on the Northern Pacific track at this point. Twenty-seven persons (25 passengers and two trainmen) were injured, but none of them fatally. The collision occurred on a high trestle. The westbound train had run about 150 ft. beyond the meeting point. The eastbound train was entirely within its rights. The westbound train should have stopped at Seventh avenue, as the signal was against it and it had no block card authorizing it to go beyond Seventh avenue, which is a telegraph office at the end of the double track at the west end of Spokane yard. The approach to Seventh avenue is on a curve to the left and the engineman asked the fireman if the signal was all right. The fireman looked out and said, "yes," but he must have mistaken the switch light for the train order signal, which was in the stop position. When the engineman got far enough around the curve so that he could see the train order signal, he noticed it was against him and set the brakes, but was unable to stop until he had run past the signal and collided with the eastbound train.

The collision at Pittsburgh, on the twentieth, occurred at a switch in the yard of the Union station, an incoming and an outgoing train being thrown together, on conflicting tracks, by the premature movement of a switch. Prompt action on the part of one of the enginemen in reducing his own speed and signaling by whistle to the other train averted a disastrous smash-up. It appears that the detector bar failed to perform its function of keeping the switch lever locked until after the train had passed over the switch.

The collision on the twenty-eighth is reported as having been caused by a sand storm which obscured the view of the enginemen of the two trains, which were approaching each other at moderate speed.

The persons killed in the derailment of a freight train near Spokane, Wash., on the fourteenth, were all trespassers—four killed and seven injured. The derailment was due to the breaking of a wheel on the third car from the engine, and 20 loaded cars fell down the bank.

The derailment near Clarion, Pa., on the sixteenth, was of a narrow-gage locomotive running without a train. The persons killed were the engineman, the fireman, section foreman and one other man, not an employee of the road; and, according to the accounts, the fatal derailment was caused by running the engine at reckless speed; that is to say, the men were having a "joy ride" which terminated in death.

The persons killed in the derailment at Jackson, Miss., on the eighteenth, were mail clerks, and their bodies were partly burned up, the wreck having caught fire and destroyed the mail car before it was possible to make effective use of the fire extinguishers on the train. Some of the passengers were taken out of the cars through the windows, but none was seriously injured. A committee of officers of the road, who investigated this wreck, in conjunction with a prominent citizen who was invited to take part, decided that the derailment was due to the malicious loosening of the rails in the track.

Of the ten electric car accidents reported in the newspapers in the month of April, three occurred at crossings of steam railways, freight trains running into street cars. In each of these three accidents ten or more persons were injured, and in one of them—at Springfield, Ill., on the eighth—one person was killed.

FOREIGN RAILWAY NOTES.

The railway from the great Swedish iron ore deposits at Gellivari and Kiruna, which passes across Norway north of the polar circle to reach the ice-free port of Narvik, which is provided with the latest Yankee notions for transferring ore from car to ship, is sufficiently Arctic in the highlands. In the middle of July, 1902, it was necessary to shovel snow from the roadbed in order to lay the rails at a point only 1,700 ft. above sea level.

The Uganda Railway, which carries lion-hunters, etc., does not yet show signs of becoming directly profitable. Its earnings were a trifle less last year than the year before, when they were less than in 1906-07. The 584 miles earned last year $733,000 gross and $324,000 net, which is about 1.2 per cent. on the cost. When beef cattle have taken the place of the countless herds of zebras, giraffes, buffaloes and antelopes of various kinds in the country along the line, it will have a large livestock traffic, and Boer immigrants from South Africa are making a beginning in this, but last year the line carried only 9,528 head.

*As long ago as 1905 the list in the *Official Guide*, giving the names of the telegraph companies operating over the railways of the country, showed 94 roads which reported "telephone" (no telegraph company).

[1] Abbreviations and marks used in Accident List:
rc, Rear collision——bc, Butting collision——xc, other collisions——b, Broken——d, Defective——unf, Unforeseen obstruction——unx, unexplained——derail, open derailing switch——ms, Misplaced switch——acc. obst., Accidental obstruction——malice, Malicious obstruction of track, etc.——boiler, Explosion of boiler of locomotive on road——fire, Cars burned while running——P. or Pass., Passenger train——F. or Ft., Freight train (includes empty engines, work trains, etc.)——Asterisk, Wreck wholly or partly destroyed by fire——Dagger, One or more passengers killed.

Shop Section.

The shop kink competition, announced last month, will close June 15. A first prize of $50 and a second prize of $25 will be given for the two best collections of from three to five kinks. Competitors may submit a greater number, allowing the judges to base their decision on what they believe to be the best five in the collection. Collections of kinks that are not awarded prizes, but which are worthy of publication, will be paid for at our regular space rates. The descriptions of the kinks and their operation should be made as clear and as complete as possible to avoid the possibility of any misunderstanding on the part of the judges. The kinks may refer to any class of work done in a railway shop, car repair yard or engine house. Data as to the average time required for doing the work with the kink, or of the time saved by its use, will add to the value of the contribution.

"We may go on making special machines and special devices all we please, but the human hand, which plays such a large part in this world, must be directed carefully and intelligently to get the highest efficiency." This sentence, taken from Mr. Owen's article on "How the Foreman Can Promote Shop Efficiency," is a good example of the broad and comprehensive manner in which the foremen treated this subject in the recent competition. A consulting engineer, noted because of his knowledge of, and interest in, railway mechanical department organization, remarked after he had read the three essays in the May 6 issue: "We have certainly got to take our hats off to the men who prepared these articles. I have a high regard for the shop superintendents and foremen with whom I have come in contact, but I must say I am somewhat surprised, but greatly delighted, at the big way in which they have tackled the subject. It certainly requires a higher grade of generalship to manage their shops in these days than it did to handle the entire motive power department of most railways 15 years ago." This gentleman will be even more surprised when he reads the essays in this number, for they are not far behind the leaders in the competition. The field covered is so broad, and each contestant has looked at it from such a different angle, emphasizing those things that have appealed to him most strongly and have been of the greatest assistance in his work, that the reader finds the last article just as interesting and helpful as the first, although he may read all of them at one sitting. For instance, while each one has something to say on the general subject of the handling of men, no two treat it in exactly the same way as to details, although they all agree more or less as to the general principles. It is doubtful if a more practical treatise on railway shop management has been published than is found in the combination of the 11 articles which received special mention in the competition, all of which will be published in our shop numbers. Their value is all the greater from the fact that they come from foremen in each of the three branches of the mechanical department—locomotive shops, car shops and repair yards and engine houses.

Shop schedules have been used in a number of shops for a long time with remarkable results in increased output. It is strange that so few shops have followed up this advantage by installing what may be termed a despatching system. Piecework, which has been quite generally adopted in railway shops, has emphasized the importance of carefully planning the work in advance so that the men will know exactly what job is ahead of them and will not only not have to waste time in looking it up, or getting an assignment, but will have an opportunity of studying it over in advance in order to save as much time as possible when they actually start to work on it. It is thus only a logical step to install a central despatching office in charge of an expert who will have exact advance information as to every job that is to be done, and will see that these jobs are assigned to the proper machines in such order as will give the most effective results in holding up and increasing the output. Each machine will thus be kept in constant operation, the material for the next job being delivered to it well in advance of the completion of the piece of work in hand. The despatcher must, of course, have records from which he will know the average time required for each job, and he must also be informed as to the time that each workman starts on a job in order to plan and assign the work to the best advantage.

The first shop to adopt such a system was at Topeka on the Santa Fe. In one form or another it is being tried out and installed in other shops. It is a step nearer to the ideal system developed by Fred W. Taylor and described in various papers which he has presented before the American Society of Mechanical Engineers. Mr. Taylor is so far in advance of the times that it will probably be a generation or more before his ideas are fully put into effect, but the splendid progress which has been made in shop management during the past few years is gradually but surely approaching his ideals. Mr. Spidy's reference to the card system of instruction in his article on "How the Foreman Can Promote Shop Efficiency" should receive careful consideration from this standpoint.

A convention of railway men had just closed. The official stenographer, a young lady, leaned back in her chair as she finished writing the last sheet of the report and exclaimed: "I am getting awfully tired of that word 'harmony.' In 15 years I have heard it thousands of times at railway conventions of all kinds. Isn't it about time they stopped talking about it and did something?" It is to be hoped that the word, or one of its synonyms, such as team work and co-operation, will be heard even more frequently at our conventions and in our organizations, for it is being recognized more and more that the efficiency of an organization depends almost entirely on the degree to which it is permeated by the spirit of co-operation. That its importance is understood by the foremen who are in close touch with the actual workers, or the men in the ranks, is indicated by the references to it in the articles that were submitted in the *Railway Age Gazette* competition on "How a Foreman Can Promote Shop Efficiency." Three of these, including the first and second prize articles, were published in the issue of May 6; three others appear in another part of this number.

Team work, or co-operation, can only be obtained when the employee realizes that it is to his best interest to co-operate with his employer; in other words, the workman must be assured of concrete returns for the additional effort which he puts forth. A prominent works manager recently said that if every one of his men could be brought to a full realization of what the company was preparing to do for them and of its interest in them, the additional effort which they would make because of their greater interest in its welfare would not only make it possible for the company to pay higher wages than its competitors, but the additional profits would be sufficient to warrant it in keeping the shop in operation during periods of depression, even if the men had to be used in doing work for which the company would never

be fully compensated. This, of course, would be an ideal condition, but the man who proposed it is known not as a philanthropist but as a hard-headed business man.

The article on the care and handling of the electrical equipment of the New York Central & Hudson River, which appears in this number, brings out some of the most interesting features of what the motive power department found necessary in the maintenance of the equipment for the 58 miles of its electric division into New York City. It has been a huge experiment. Electric locomotives of the design used had not previously been subjected to service conditions. Although in their main features the company's most recently built locomotives correspond with its first ones, several alterations have been made, chief among which is the substitution of the four-wheel for the two-wheel trucks, increasing the wheel base from 27 ft. to 36 ft. A number of minor alterations have been made in the design of both the locomotive and the motor car equipment, the necessity for which has become apparent through the constant and rigid inspections that the equipment receives. Good team work is apparent in the organization. The enginemen are best acquainted with the equipment in actual service, and make full reports of troubles. The shop foremen know the equipment best as concerns design and actual alterations and repairs and meet with the superintendent every two weeks for discussion and general planning. A private telephone system connects all the offices interested in this work.

The representative reports reproduced in the article are interesting as illustrating the careful attention to details which is necessary. For instance, when a contact shoe is broken by striking an obstruction beside the track, the immediate communication of this fact to the office of the superintendent electrical equipment is necessary in order to prevent a similar accident happening to a closely following locomotive. As the equipment was at first, to a large extent, experimental, so it is yet as regards the details of its operation and maintenance, which are being closely watched. It is this part of the subject that should appeal to steam railway motive power departments as presenting methods which should be applicable to their equipment.

IMPROVED METHODS OF HEATING AND WELDING.

The principal objection to the ordinary method of heating metal by a coal fire is the long time required and the consequent expense for the workmen's time which is virtually wasted while they are waiting for the metal to heat. The forge fire in the smith shop answers very well for small pieces, but it is slow and dirty and is gradually being superseded by the oil or the gas furnace. Most of the new smith shops and forges are equipped with oil furnaces, but the new shops of the Delaware, Lackawanna & Western at Scranton have a special gas house and producer for making water gas. At the Altoona shops of the Pennsylvania a large gas plant is used in connection with the forge furnaces. Other shops favorably situated in the natural gas belt use that kind of gas for most heating purposes about the shops as well as for steam making.

For portable heaters, such as are used in heating tires, crude oil, gasolene and commercial gas have all been used successfully. At the Collinwood shops of the Lake Shore crude oil is used for such purposes, but it is first gasified in a muffler or firebrick retort and is not used directly from the burner where it is atomized. There are some objections to the use of gasolene for heating, the principal one being its liability to sudden flaming or explosion, causing destruction of property by fire. Gasolene is so volatile that there is a constant loss by evaporation when the vessel containing it is not tightly closed; the large consumption for other purposes has caused the price to rise, so it is no longer the most economical fuel for portable burners. At 10 cents per gallon for gasolene and 85 cents per 1,000 cu. ft. for commercial gas, careful tests have shown a saving of 16 per cent. in heating tires with the gas. The cost of fuel for heating a tire 62 in. inside diameter was 20 cents for gasolene and 16.9 for commercial gas. The average time required per tire was 17.5 minutes with gasolene and 14.3 minutes with commercial gas. The cost of crude oil for the same purpose has been reported as low as 15 cents and as high as 30 cents, the difference being doubtless due to the comparative efficiency of the burners.

Rapid progress is being made in the new welding processes in railway shops. In the welding of frames by such methods a considerable amount of skill is required to prevent fracture in the weld or in another part of the frame by shrinkage, and some experience is required to give the proper amount of preheating. If the weld is made on one member of a double barred frame it is necessary to heat the other member with a torch in order to get equal expansion and contraction in both members to prevent unequal strains. Where thermit is used the fractured part is forced open about ¼ in. by a jack so as to allow for the contraction when the metal cast around the frame cools. The pressure is gradually released on the screw jack as the weld cools. On some railways this nice adjustment has not been obtained and a number of frames have subsequently broken at the welds, but where the work has been properly done the welds are entirely successful.

Autogenous welding is attaining much importance and prominence throughout the world. In Germany there are over 1,000 welding plants using the oxy-acetylene blow pipe, and there is a similar number in France; also large numbers of plants in Italy and Belgium. In England while there are good oxy-acetylene gas plants, the men are not properly taught to handle the apparatus. The result is the work performed is of an inferior character and this hampers the success of the industry. This is also true to some extent in the United States, but the methods that are employed to insure success in Germany and France are being gradually introduced here. Germany has an association devoted to autogenous welding, recruiting its members entirely from users and manufacturers of welding plants. The work of instruction in the new art of welding is carried on through periodicals and the institution of free courses in teaching it; in this way the workmen are made familiar with the new process by practical demonstrations. The fundamental principles are also taught. Free courses of instruction in autogenous welding were inaugurated in France about a year ago and they are open to foremen and workers in any line of trade which can be benefited by the use of the process.

The fire risk involved in the use of the acetylene apparatus is a matter that is assuming much importance, and a meeting of the manufacturers of the apparatus and appliances used in connection with the oxy-acetylene blow pipe was held recently in Chicago. The object was to study the rules and regulations drawn to safeguard the industry by the engineers of the National Board of Fire Underwriters. These rules should interest those in charge of railway shops using the apparatus, as they call attention to methods that are dangerous, as well as to the proper means of safeguarding the plants and apparatus.

With the construction of the railway between Corrientes and Asuncion, which was contracted for by the Minister of Public Works on January 20, 1910, the Argentine North East Railway and the Central Railway of Paraguay will be joined and direct communication between Buenos Ayres and Asuncion established. Hitherto all passenger and freight traffic between these points has been dependent upon water transportation. The national government will contribute £2,000,000 toward the construction of this important link in her international railway system.

Contributed Papers.

HOW THE FOREMAN CAN PROMOTE SHOP EFFICIENCY.*

BY C. J. DRURY,

General Roundhouse Foreman of the Atchison, Topeka & Santa Fe, at Albuquerque, New Mex.

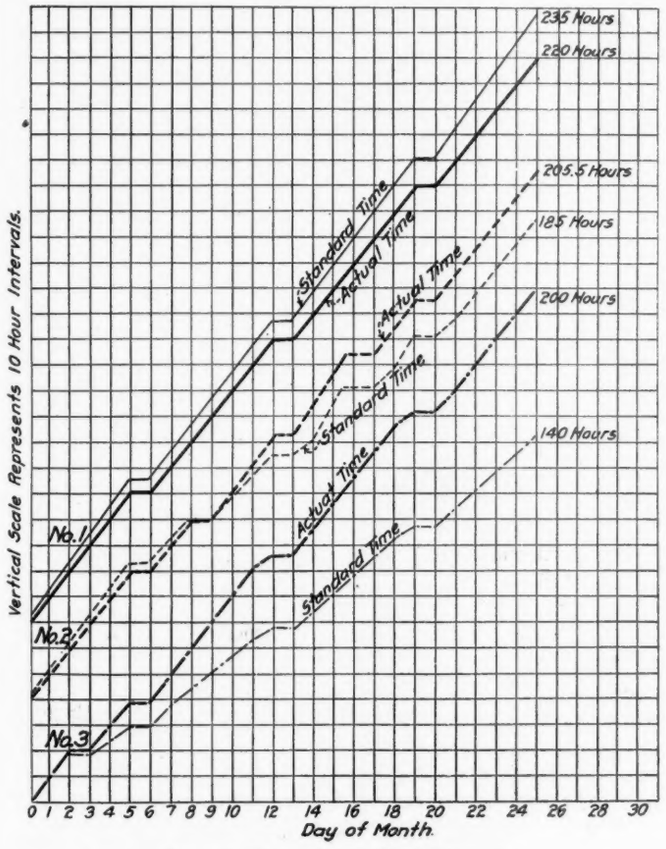
Harmony within his shop and in its relation to associated shops is a condition which every foreman should try to produce. At the same time discipline should not suffer for the sake of harmony. No shop can attain ideal or high efficiency if harmony does not exist. We may force, fight or drive work through the shop, but we will not attain high efficiency if good feelings do not exist between helper, mechanic, foreman, master mechanic or superintendent. Contention should be avoided.

Having harmony, better supervision should be one of the next essentials towards producing shop efficiency. We have found in recent years that we require more foremen than were formerly needed because of the recently designed power and the modern machines and equipment that have been placed in our shops to hasten the output. It is often the case that, in place of three or four boilermakers, machinists or carpenters being needed, it is a foreman that is lacking. There is scarcely anything that will cause the efficiency of a shop to drop quicker than through having the foreman supervise a greater number of men or a larger amount of work than he can cover. A foreman should keep his tools, machines and equipment in the best possible condition so that they can be crowded to the full capacity all the time.

The work in the shop should be specialized even to the smallest operation. Past experience has taught us that on special work a man becomes most proficient; he has tools and kinks fitted up for the work he is to carry on, therefore he can more readily do the job, while his neighbors perhaps would spend considerable time in looking for the tools to do the work. The matter of specializing should be given very close attention by the foreman. We find in specializing the work that the amount of supervision required is not as great as when the work is otherwise carried on. Specializing the different operations should be practiced in the roundhouse as well as in the other departments.

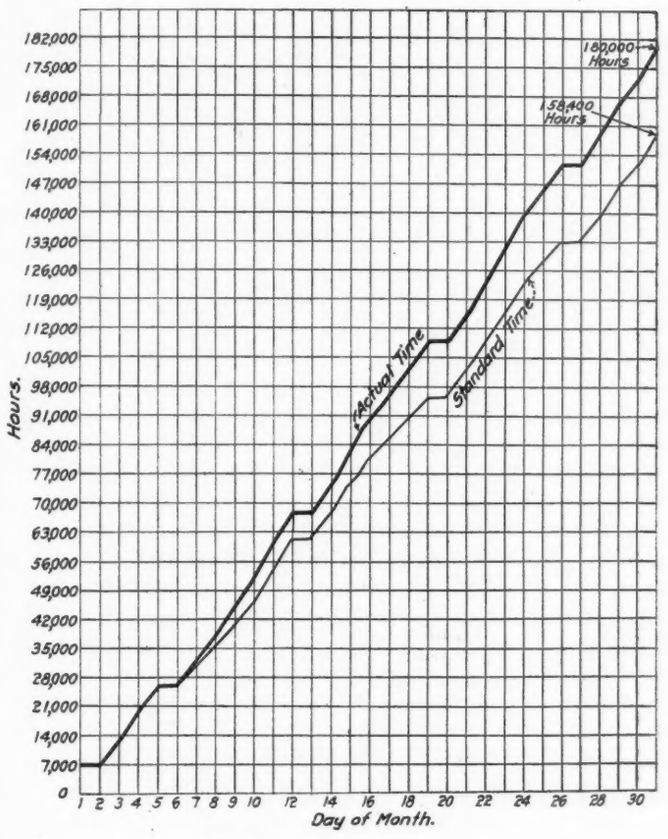
A shop should not be run where one man is depended upon to do certain particular work. We should be educating our men in such a manner that if a mechanic happens to quit or absent himself, his work can be taken up by another without allowing the efficiency of the shop to suffer.

It has also been found that the scheduling of the work through the shop tends to create a higher efficiency. For example, a locomotive going to the shops for general repairs is dated in, perhaps on the first of the month, and booked out for the twentieth. The stripping could be scheduled to be finished on the first day, the shoe and wedge work the fourth, the driving box and spring gang the tenth, boilermaker work



Record of Individual Workmen.

No. 1. *Ideal Workman.*		*No. 2.* *Spasmodic Workman.*		*No. 3.* *Poor Workman.*	
Efficiency = 107%.		Efficiency = 90%.		Efficiency = 70%.	
220 hrs. at 36c.	$79.20	205.5 hrs., 36c.	$73.98	200 hrs. at 36c.	$72.00
20% bonus	15.84	Bonus	7.33	Bonus	.16
15 hrs. gain....	5.40				
Total wage	$100.44	Total wage..	$81.31	Total wage..	$72.16
Actual rate,	45.6c.	Actual rate,	39.5c.	Actual rate,	36.08c.



Record of Entire Shop.

Per cent. efficiency.	Hours.	Men rated at 25c. per hour.	Surcharge at 40c. per hour.	Bonus.	Total.
88	180,000	$45,000	$75,000	$3,744	$120,744
100	158,400	39,600	63,360	7,920	110,880
Loss to company					$9,864
100	180,000	$45,000	.....	$9,000	$54,000
88	180,000	$45,000	.....	3,744	48,744
Loss to men					$5,256
Average rate per hour, without bonus					$0.25
" " " " with bonus at 88 per cent.					.275
" " " " with bonus at 100 per cent.					.30

*These articles were submitted in the competition on this subject, which closed April 15. The first and second prize articles and one other were published in the *Railway Age Gazette* of March 6, 1910.

the fifteenth, rodmen the eighteenth, and so on through all operations. At present this system is being used on the Atchison, Topeka & Santa Fe Railroad, and in a short time after the introduction it was found that we were able to cut down the time of detention in the shop. By assigning a date for the completion of the different operations it keeps the shop working under a sort of pressure, which certainly creates efficiency. Close inspection should be followed up by the foreman to see the jobs personally as they are being assembled. While we are striving for high efficiency we should watch the quality of our output as well as the amount.

The correct handling of apprentices is very important in maintaining high efficiency. In shops where as many as ten or twelve apprentices are employed there should be an instructor appointed, whose duties are confined to the mechanical education of the boys. Also in larger shops the school system of instructing in mathematics and drawing should be practised. This kind of an apprentice system is thoroughly inaugurated upon the Atchison, Topeka & Santa Fe, and we have shops where the efficiency of apprentices have increased from 88 per cent. to 105 per cent. efficiency under it.

An individual effort system whereby the workman is compensated for his special efforts by a cash merit is a great promoter of high efficiency. I do not exactly favor a piece work system, but do approve of a system where an employee is paid an hourly or monthly rate, and given a cash consideration for his increased efforts on an efficiency basis. An individual record should be kept. By keeping record of the information shown on the accompanying chart, the efficiency of the workman is known and his advancement to a position of greater usefulness can be determined.

By setting "standard time" on each operation performed by each workman, a totaling of standard times for all operations of all men and the actual time taken can be determined, showing the efficiency of each shop department and for the shop as a whole. By thus determining the efficiency of each department a much better comparison of the amount of work turned out can be reached than by any old haphazard manner of counting the number of engines or cars repaired. This old method is inconclusive owing to there being no set measure of the amount or character of the work done on each car or engine, nor of the condition of the car or engine when received at the shop and when again placed in service. The attempted classification of character of repairs now in vogue is mostly based on the amount of money spent with scarcely any reference to the amount of work done. This method may show for the shop with a poor organization and high and inefficient labor costs a more creditable output than that of a shop with good administration and low and efficient labor costs.

A shop run as above recommended will operate at a high efficiency and will make creditable earnings both for employee and employer.

BY E. T. SPIDY,

Instruction Card Inspector, Canadian Pacific, Angus Shops, Montreal, Canada.

The shop foreman's success in this direction depends, to a large extent, on the limits to which he can exercise his power to make alterations in the shop and its methods of working, and the amount of co operation he receives from his superiors, as well as from the men under his charge. A foreman is in reality the pivot upon which the smooth running of the shop depends. He has to bear the load laid on him by his superiors in his responsibility for efficient output, and he has also to keep his men "well oiled" in order to ensure the smooth running of the "inner" working of the shop. This double responsibility must always be kept in view. The situation is governed by two words which are the keynotes of all efficient shop management. They are system and co operation. Bear in mind that when you have a system that ensures the co-operative efforts of the men, and gives them confidence in your acting right towards them, so surely will your output be increased.

The following discussion is intended to be helpful to the foreman who intelligently desires to make the most of the machinery in his care. The questions and suggestions are based on an average machine shop, where all the machinery may not be of latest type, but where the best possible efficiency is desired. The questions are not arranged in order of importance, for it would be difficult to decide which was the most important.

"Is my piecework system in good condition—can I improve it in any way?" The foreman is often called upon to set a price for a piece of work. Considering the multifarious duties he has to perform, it is almost beyond reason to expect that all the prices he makes are good, either from the employer's or employees' point of view, and his knowledge as to what a job is worth is often left to the workman's honesty on the first piece, or to his own judgment in comparing it with similar jobs. A foreman does not get the time to study each job sufficiently. The time has come when uncertain methods like this have to be abandoned and more accurate information on the subject obtained. The situation may be improved by the setting apart of a man, whose duty it should be to study the work, the machine, the man, and the conditions under which he works, and also to set the price. This man will be responsible for any information the foreman should require with reference to the work and must be on hand when the foreman approves of the price submitted. Not only will this man relieve the foreman of a vast amount of work, but in a short time he will be of great value to him. He will be able to not only supply the foreman with details as to the condition of the machines, but also to suggest new tools, jigs, etc. He will become an expert in this line. In selecting him the best possible judgment must be used, for the success of the system will depend largely on him. He must be a man of average experience, fairly well educated and a good workman, a man of activity and energy, and one not afraid of the feeling he will at first arouse. More than likely the workmen will be prejudiced against him at first, but he must work to gain their confidence, so that finally with their co-operation the best results or maximum efficiency will be attained. His success in obtaining the co-operation of the men will do more toward efficiency than any driving system that exists or ever did exist.

"Have I machines that are overburdened or doing a class of work for which they are not suited?" It may not be possible to rearrange the machines in the shop, but as it is the foreman's duty to assign the work to them he should be careful that it is proportioned equitably and not to have a light machine doing a class of work beyond the range it was designed for. He should be on the lookout to avoid congestion. More machine failures are to be traced to the unsuitability of the work operated on than from any other cause, and this may often be obviated by a little discretion in assigning the work to the machines.

"In what condition are the machines? Are they in a state of good repair?" This is a point too often neglected and often a couple of men may be seen around the shop continually "patching up" the machines. To maintain efficiency it is necessary to keep up a high standard of repair, and when anything goes wrong to have it repaired properly rather than to "patch it up for the time being," for it pays in the long run in the life of the machine.

"Do any machines require respeeding?" The progress made during the past few years in high-speed steel, and the cutting speeds possible with it, as compared with ordinary carbon steel have made it necessary to revise the speed of the machines in order to take full advantage of its properties. There is little gain in using high-speed steel tools unless

they are operated at their maximum cutting speed. Certain machines may have a large enough range to cover this, but many will be found deficient. Drilling machines require attention especially in shops where they are not of modern type. While in the case of lathes, boring mills, etc., feed and depth of cut may be easily increased, a fast feed on a drill necessitates a high cutting speed for efficient work, and a machine is required to run up to 300 r.p.m. to keep in tune with modern high-speed drills.

"Am I using the best steel obtainable? Do I know what the best steel is?" This is a question well worth studying and will pay well, for a large item on the expense account depends on it. It is admittedly more the work of a specialist, but the foreman should know, as so many new and different steels are at present on the market, all of which claim to be the best. No doubt many have special features worth consideration, and they should be tested to find which one is best suited to each class of work and the machines. No definite rule can be laid down as conditions vary greatly, so experiment is the only satisfactory method of obtaining any reliable information.

"Are my tool standards correct?" All shops nowadays have tool standards in some condition or other, and it will not be necessary to emphasize having a standard shape for grinding cutting tools to. Standardization may be carried too far, however, because good practice shows that work of large diameter requires different cutting lip angles on the tools from that required by average work. Much information on this point may be obtained from grinding machine manufacturers and although too much reliance must not be placed on it, yet modified by results of experiments, a considerable saving may be effected.

"Do the men receive their tools in a satisfactory way?" This question of distribution is important, for in order that a machine may pay the best dividends it must be in constant use. Therefore when tools require replacing they should be collected from the men and new tools delivered to them, thus avoiding the necessity of their walking to the tool stores to wait about or otherwise waste time. A man may be permitted to grind his tool when it only requires "touching up," but when he has any amount of metal to grind away it should be sent to the tool grinding department. A sufficient number of grindstones should be in the shop and should be well placed to avoid the men congregating at them.

"How is the tool room stocked? Are there sufficient tools ready for delivery?" Nothing will tend to drag back a shop more than a deficiency in the number of tools. Having decided what steel is best, have a quantity of tools made so that the workman will not have to slow down his machine because he is obliged to use an inferior tool. Firms are naturally slow about buying a lot of high-speed steel on account of its high price, but first decide if it is worth it, and, if it is, get enough tools made to be of use to you and not enough to "go on with." The expense of the more elaborate tools, such as milling cutters, jigs, etc., requires that a system of checking be adopted that the tool may be traced if needed urgently anywhere else. Small metal checks with the men's number on will answer admirably, the man giving a check for each tool he receives, the check being placed where the tool was taken from. Obviously there must be a systematic arrangement of tools in the tool room to operate this system successfully.

"Do the men have trouble in getting their work?" It is the foreman's duty to see that the men are supplied with work, but apart from seeing that the work is suitable to the machine, he must employ a method by means of which the men know what is to be done next, and not to have them waiting on him or any of the gang bosses for information. It is not possible without an extensive system of instruction to entirely eliminate this difficulty, but much may be done by careful forethought. This matter is receiving much attention from some of the more progressive concerns, and card systems of instruction to the men are being developed to a high degree.

"What kind of hoist service have the men at their machines for individual use?" The individual hoist service a man has at his command has much to do with his output. The position of the machine and the roof construction of the shop are the main factors in determining the overhead rail arrangement applicable. Compressed air hoists of the cylindrical type are being gradually recognized as superior for this purpose, although not always applicable by reason of their length, but a power hoist of some description should be used in preference to hand blocks. Where machines are arranged in lines, end to end, a continuous overhead rail is economical as it will not be necessary to supply a hoist to each machine. This system is also good in connection with heavy bench work, where the work may be transported from the vise to the shop trucks or anywhere required. When machines are separated a radial crane track is very serviceable, or, where this type is undesirable, a semi-circular rail suspended from the girders and serving two or three machines is often good. The foreman should have little difficulty in finding the type best suited to his requirements.

In Conclusion.—Many foremen may say that they have not the time to study these questions in the detail, but let them remember that unless they do give thought to these details they will progress little beyond their present state. It is in considering the details that progress is to be obtained, for it is the little parts that make the whole. Much may even be attained by the judicious placing of apprentices. See that the men are provided with sufficient light. See that there is an adequate supply of water or cutting compound; a system of overhead supply to each machine with a return flow to the pump beneath the floor is worth considering. Belts should be looked after and an indicator system should be employed to enable the workman to locate the belt-lacer when required. This indicator system may also be employed for other officials, if considered necessary. If the foreman has not the time to look to these details, then it is up to the management to give him such assistance that he may be in the position to consider them. There must be harmony in the management and, although somewhat difficult to obtain, the co-operation of the workmen. When combined with systematic organization, no doubt remains as to ultimate results.

BY ELMO N. OWEN,

General Foreman, Southern Pacific, Bakersfield, Cal.

Each shop has its special or local conditions which must be studied intelligently. One foreman can accomplish a great deal by himself, but if all the foremen do not pull together, individual effort will not count for nearly what it should; they should all be in friendly touch with one another. Some men, in the handling of a number of subordinate foreman, think it best to keep up a constant contention and bickering among them. Such is not the way to get the best results, and in the end it will pay small dividends on the capital invested.

Let us begin with the machine foreman to see what he can do to improve the efficiency of a shop. The machine side of a railway shop controls and almost dictates the output of any shop, for if work is put up to the floor men at the right time and in right quantities, that side will get the work done. The machine foreman's duties are many and varied. He should know which engine came in last and which is first out, and usually, along with taking care of the back shop work, he must take care of the roundhouse work. The secret of his success will lie in his being able to handle the rush work without throwing half finished jobs out of the machine that will take a great deal of time to reset, when

a few minutes longer would have completed them without delaying the roundhouse job materially. One of the things I learned early in my experience as a machine foreman was never to throw a half completed job out of a machine unless the urgency of another case absolutely demanded it; if good judgment is used few cases will be found so urgent, for work can be shifted from one machine to another and with a few minutes wait, time and money can nearly always be saved and the rush work will be done on time.

Railway shops are fast approaching a manufacturing basis by doing work on a store order system, and a machine foreman finds an opportunity to increase his output by making parts in constant demand in large quantities so as to reduce the cost per piece, for it is a well known fact that several pieces can be finished cheaper than one or two. In this connection, it seems strange that so many large railway companies go on keeping up expensive organizations at remote points, paying highest prices for labor with the consequent labor troubles, besides the time and trouble trying to keep a reliable set of mechanics, when a large manufacturing plant located where labor is plentiful, shipping facilities good, health conditions first class, if conducted on a manufacturing basis would pay large returns on the investment, and the shop efficiency could be raised to its highest plane.

Another important duty of any foreman is to see that he thoroughly understands all about a piece of work brought to him so as to be able to intelligently direct the handling of it. In doing this he will avoid many mistakes and be able also to rush to completion any piece of work. Often a foreman is notified that he will be sent a certain job which he cannot have at once; he should acquaint himself with all the details connected with it and plan how the work will be done, by whom and where; then when he receives it no delay will occur in starting. It is surprising how this will increase the output.

A foreman must see that each man has work enough ahead of him at all times for at least a day in advance, for a man who hasn't a little ahead of him will be afraid of running out of a job, but if he has work all around him will keep busier and be more contented.

As has been said, one of the most important things for shop efficiency is team work among the various foremen; some foremen will advance the work under their control without a thought of the other foreman, often hindering and putting the others back. This should never be allowed, for it will not help pay dividends. Personal feeling (antagonistic) should not enter into the acts of any foreman, but he should place himself above a thing that debases or belittles anyone if he is to be altogether successful.

The successful handling of men in itself is a large factor in the output of any shop and here is where the individual foreman can get in his best work. For my part, I do not believe men should ever be abused, but always treated kindly. Abuse may have answered in days of slavery, but in modern times it finds no place; as soon as you undertake to drive a man in these times he leaves you, then you are looking for a man to take his place, and possibly get one not so competent, besides the unnecessary expense of educating him to your methods and shop conditions. Kind treatment will keep a man contented, and he will be a far greater factor in increased output than if abused. Kindness does not mean favoritism—far from it—and favoritism should not be shown.

Even in administering a rebuke, kindness can be shown, and you thereby win a man's respect and loyalty, whereas, ill treatment will at once make him antagonistic. Reprimands rightly given sink deep and make lasting impressions and seldom call for a second along the same line and may not call for it in any way again. In so far as the individual foreman handles his men to make them loyal and works in harmony with his fellow foreman, just so far is the output of any shop brought to its greatest efficiency. A kind word to a man costs nothing and pays great returns.

There is a tendency among labor organizations to-day to decrease or rather hamper output and keep it down, and here is where individual effort and kind treatment of men by the foremen comes into play, doing more to overcome this hateful condition than any other one thing, for the individual workman of to-day is and can be made as loyal as ever, except in a few cases and one is not long in finding them out. A man who abuses his employees soon finds that while he is looking they are all working and when his back is turned they are all loafing, while if he treats them respectfully they work as well when his back is turned as at any other time. Some will say all I may have said about the treatment of men has very little to do with output of the shop or shop efficiency, but all I ask is that any man try either method and compare results.

To show how a shop was brought to a high state of efficiency by one master mechanic I will explain his methods. To begin with, he held a foremen's meeting once each month, to which all foremen were invited, and they came with the understanding that each was to give a statement showing in what way he had improved facilities for handling the work in his department or at any place in the shop. All the improvements were discussed and other subjects were brought up and suggestions of all kinds offered for betterment. A copy of the proceedings was sent to each foreman showing who had made improvements. If one had done nothing that could be reported, he was likely to be given some good natured raillery; the writer got it sometimes but never felt hurt, indeed he felt spurred on to do better the next time. Two years of the most pleasant work of my life were spent under that master mechanic and better team work among foremen was never seen and their feeling of pleasure in their work was, to a certain degree, passed down the line to the individual workmen. Would anyone doubt that such methods added to the efficiency of that shop?

We may go on making special machines and special devices all we please, but the human hand that plays such a large part in this world must be directed carefully and intelligently to get the highest efficiency.

REPAIRING LOCOMOTIVES AT THE SAYRE SHOPS.

The Lehigh Valley shops at Sayre, Pa., have established a new time record in repairing locomotives. For the seven months from September 30, 1909, to May 1, 1910, one locomotive was turned out for every three and a half working hours. A detailed statement of the work done is shown in the following table:

Month.	Rebuilt.	New fireboxes.	Back-flue sheet.	Engines, total.	Hours worked.	Hrs. worked per engine repaired.
October, 1909...	..	5	6	50	168	3.4
November, 1909..	1	4	5	47	152	3.2
December, 1909.	1	4	5	52	184	3.5
January, 1910....	1	6	5	53	168	3.2
February, 1910..	1	3	6	41	153	3.7
March, 1910.....	1	4	8	47	198	4.2
April, 1910.....	2	6	11	61	212	3.3
Total	7	32	46	351	1,235	3.5

The Lehigh Valley repair shops at Sayre are the largest under one roof in the United States. The force of employees includes 1,000 men who work on locomotives alone, 450 on freight cars, and 150 on passenger cars. The plant covers 57 acres.

The northern section of the Tientsin-Pukow Railway, China, has been completed to Chuang Chow, and construction trains are utilizing the track for carrying material.

The railway board of the Japan government railways has under its jurisdiction 2,500 locomotives, 6,000 passenger and 35,000 freight cars. It is proposed to increase the number in each division by about 5 per cent. to meet the increased traffic.

Shop Kinks.

FROM THE WEST MILWAUKEE SHOPS OF THE CHICAGO, MILWAUKEE & ST. PAUL.

REACH ROD JAW SLOTTING TOOL.

The gang slotting tool shown in Figs. 1 and 2 was specially made for reducing the labor cost on new locomotives. A hundred or more jaws were ordered at one time, and finished in large lots. Under the old method of slotting with a single tool, it required two hours per jaw. With the gang tool having three cutters, the central portion and the two outside faces are finished at one operation, the time required being only 35 minutes.

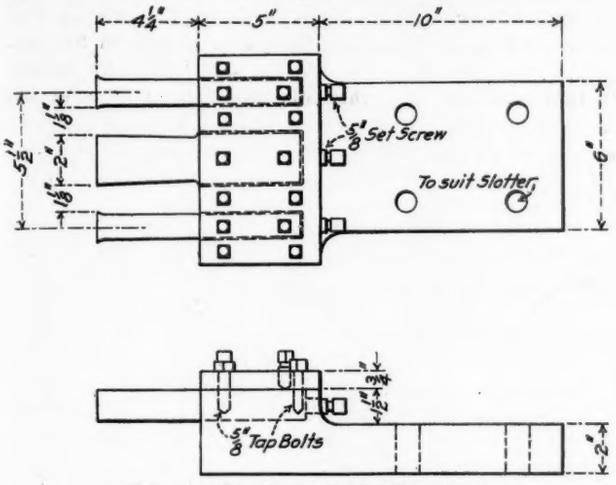


Fig. 1—Reach Rod Slotting Tool.

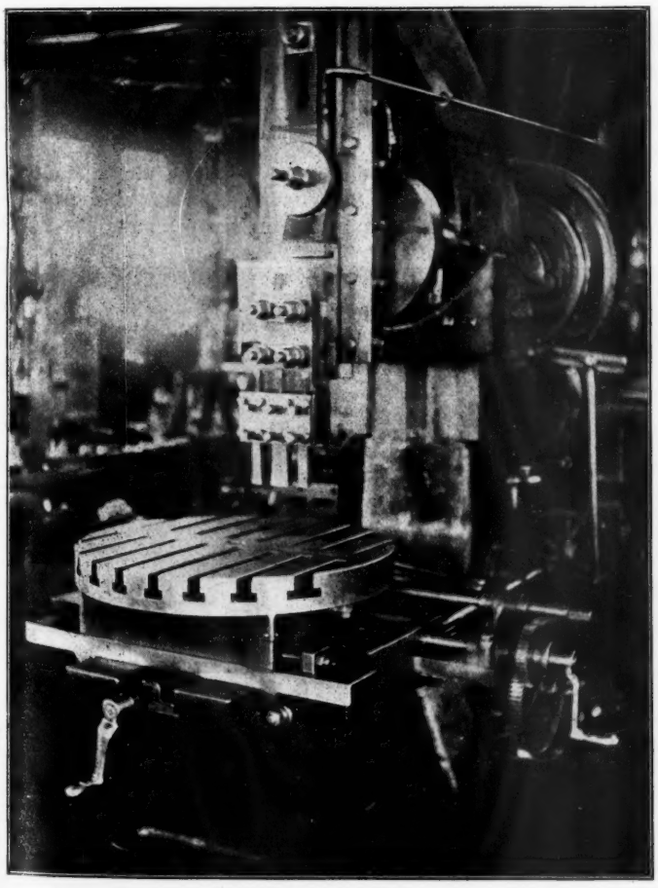


Fig. 2—Reach Rod Slotting Tool in Operation.

AIR PUMP CENTERING STAND.

The stand for centering air pumps, shown in Fig. 3, is intended to overcome the difficulty of chucking them for reboring. The outside diameter of the slip ring A is a sliding fit in the counterbore of the air pump. The boss B fits neatly into a hole in the center of the boring mill table. The pump is placed on the stand and the slip ring is pushed up into the counterbore. The pump is then clamped down to the boring mill table and the slip ring is pushed far enough out of the way to permit of boring the centered cylinder. This device saves about 15 minutes in reboring each pump cylinder.

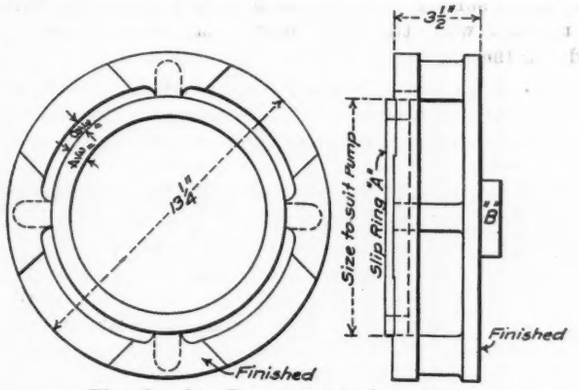


Fig. 3—Air Pump Centering Stand.

PACKING RING GANG TOOL.

A gang tool for turning and finishing cylinder packing rings is shown in Figs. 4 and 5. While it is usual to employ gang tools for cutting off the rings from the finished cast-iron pipe, this device includes a roughing tool in the same arbor with the six cutting-off tools. The rough casting is just large enough to permit of cutting five rings and is finished on the inside with a regular cutting tool. The outside is turned with a tool in the second mill head and the rings are separated and finished on the sides by the narrow gang cutters. The number of rings finished by the ordinary method with a single tool is one per hour, while the gang cutter will finish three rings per hour.

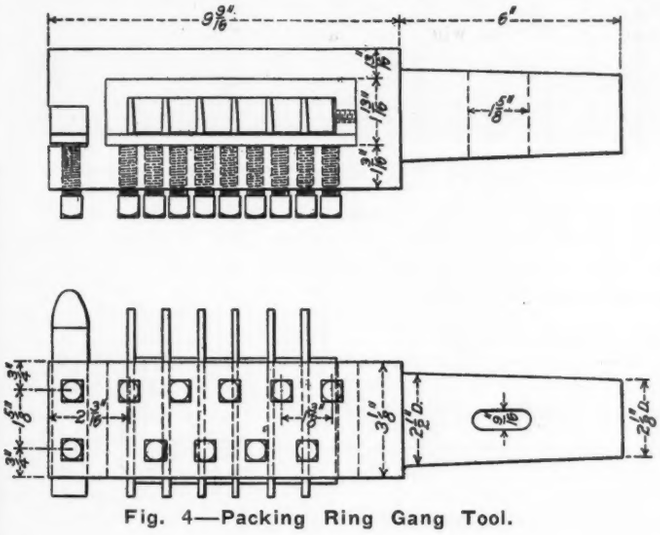


Fig. 4—Packing Ring Gang Tool.

SHAPER SLOTTING TOOL.

The slotting of the diagonal ports in bushings for piston valves is a slow process at best and usually requires considerable filing after the slotting is completed. By the use of an angular cutting edge on the broaching tool shown in Fig. 6, most of the diagonal ports can be finished on the small slotter. The photograph, Fig. 7, illustrates the manner in which the bushing is chucked on the shaper, and the drawing shows the

shape of the broaching cutter. The old method of slotting these ports required 8 to 10 hours, but by this improvement the work can be done in 4 hours.

POWER ROLLS FOR FLANGING.

A method of off-setting the flange of the conical connection sheet of boiler shells by the use of the power rolls instead of by the usual method of flanging by hand is shown in Fig. 8. A short piece of an old driving axle about 8 in. in diameter and 10 in. long is placed on the two lower rolls near the flange end of the sheet and another piece, smaller in diameter, is placed near the other end. The difference in the diameter of these pieces is made sufficient to flange out the end of the

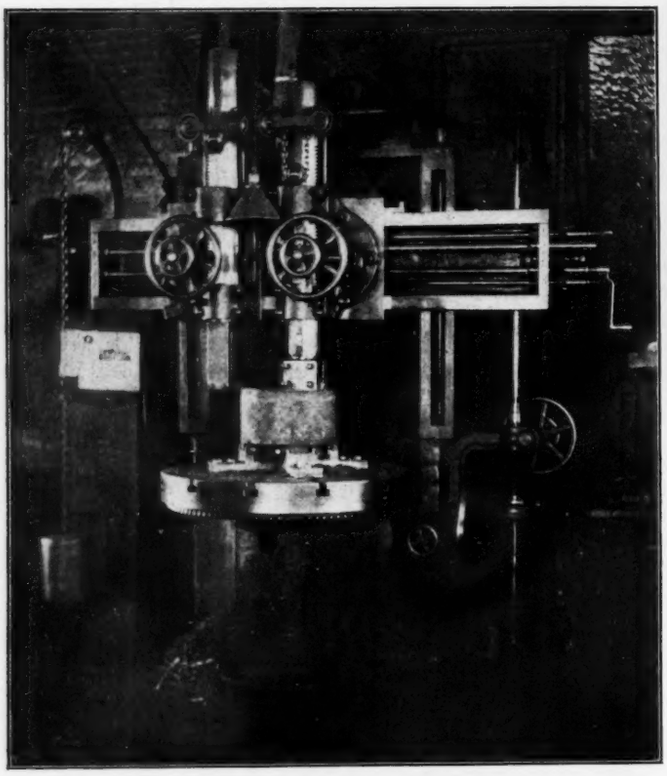


Fig. 5—Packing Ring Gang Tool in Operation.

sheet for a short distance when it is desired to have a horizontal seam for the rivets. We believe this is entirely original with A. N. Lucas, the boilermaker at West Milwaukee, and have the impression that it is not used at other boiler

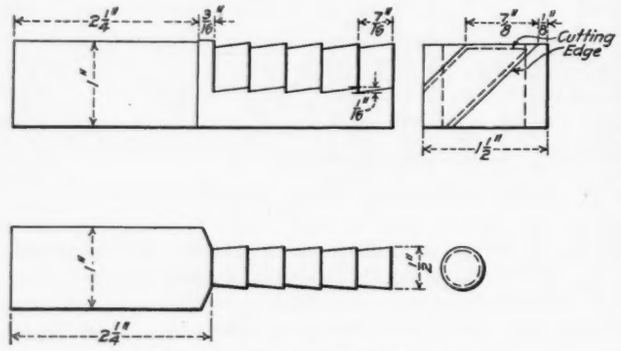


Fig. 6—Shaper Slotting Tool.

shops. It requires three hours to flange this conical connection on the rolls, while the old method of flanging requires about eight hours.

KINKS FROM VARIOUS SOURCES.

GREASE PRESS.

A press for molding the grease to fit the grease cups on locomotive connecting rods is shown in the photograph, Fig. 9. It is in use at the East Buffalo shops of the Delaware, Lackawanna & Western. The power is furnished by two 8-in. air-brake cylinders, placed tandem. The grease is placed in one end of a third cylinder of the same size. The grease hopper is

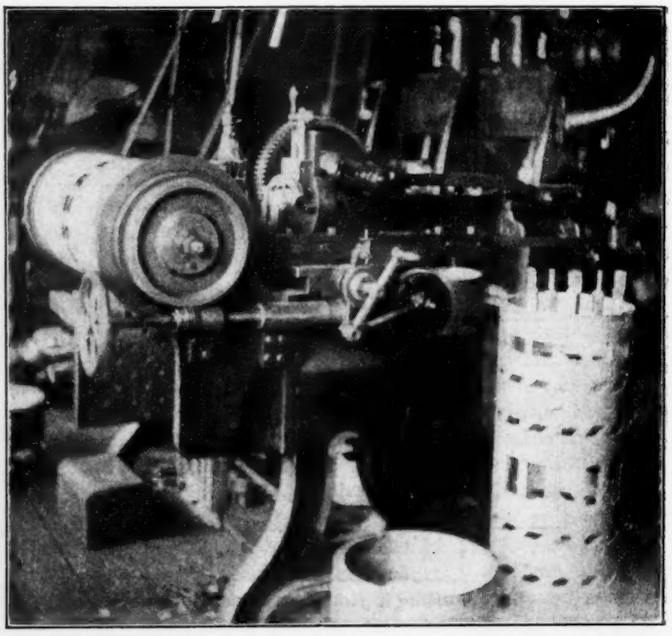


Fig. 7—Shaper Using Special Tool on Valve Bushing.

made of light copper plate, is 7½ in. high, 6¼ in. square at the top, and has an opening into the cylinder about 3½ in. square. The grease is pressed out through the pipe at the left-hand end of the cylinder, and is cut into pieces of the proper length by means of the box, part of which is shown just behind the cake of grease that is being pressed out. The cutting is done with a simple form of knife made of a piece of thin sheet iron and shown in the photograph.

To return the pistons to their initial positions, air is admitted to the left end of the middle cylinder by means of a three-way cock. The apparatus is bolted on a steel plate, ¼ in.

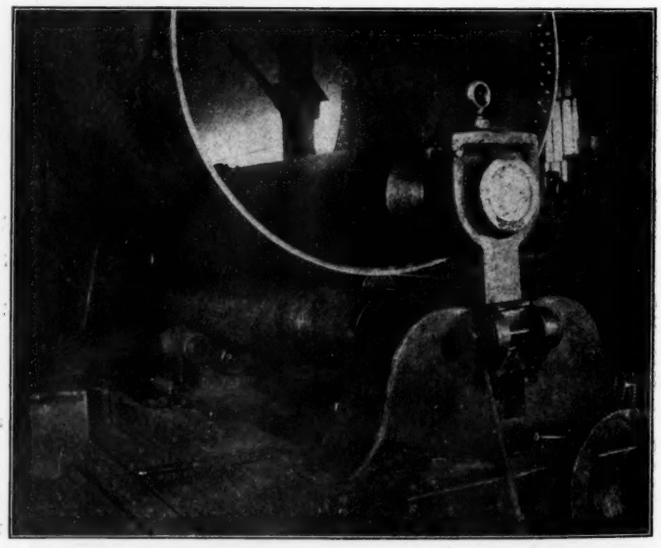


Fig. 8—Power Rolls for Flanging.

thick and 7 ft. long, which is flanged down on the sides and is supported by cast iron legs, braced by wrought iron straps. The middle cylinder and the one containing the grease are tied together by two ⅜-in. rods, as well as being bolted to the table. A shelf for the storage of the grease cakes, built of 3/16-in. steel plates, is fastened to the wall at the right of the press, and contains three compartments.

HOSE COUPLING AND NIPPLE MACHINE.

Compressed air is now almost universally used for applying couplings and nipples to hose. There are many designs of machines used for this purpose, one of which, in service on the Southern Railway, is shown in Fig. 10. It consists mainly of three cylinders, A, B and C, mounted on a bench. The A cylinder is vertical and contains a piston whose rod is attached to the upper part of the hose clamp D. The cylinder A, made of a piece of 4½-in. pipe, has a spring which tends to maintain the piston in its upper position. The piston rods of the two end cylinders B and C carry holders that take the nipple and coupling respectively. The hose is placed between the clamps and the air is admitted to the vertical cylinder. The clamps are 20 in. long, with a clamping surface of 14 in. A flare at the ends allows for the increase in the hose diameter, due to the insertion of the metal pieces.

METHOD OF HANDLING COACH TRUCKS.

An ingenious method of utilizing the weight of a coach for power in lifting the truck from its wheels, which is employed at the Skaguay, Alaska, shops of the White Pass & Yukon Route, is shown in Fig. 11.

The jacks are quite similar in construction to those used at the Elizabethport shops of the Central Railroad of New Jersey, as illustrated and described in the *Railway Age Gazette* of April 1, page 873. The jack, illustrated herewith, has 6-in. gas pipe plungers, the top ends of which are left open. In placing

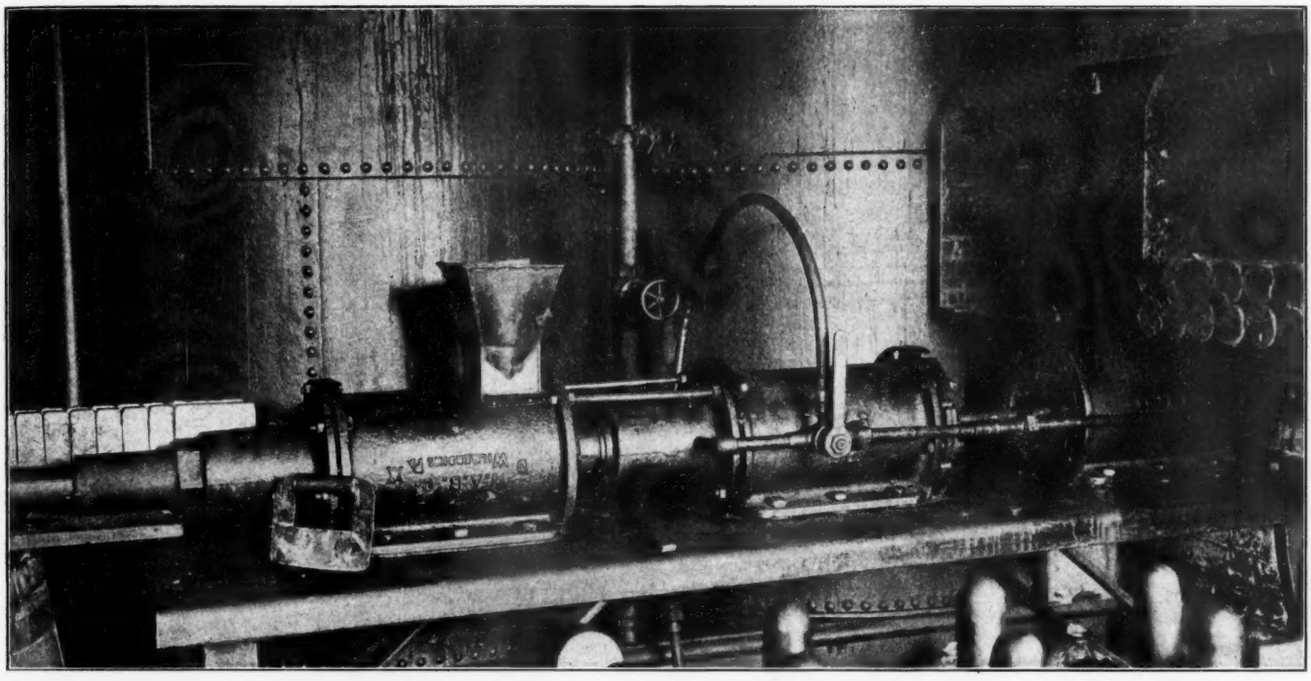


Fig. 9—Press for Preparing Grease Cakes for Connecting Rod Grease Cups.

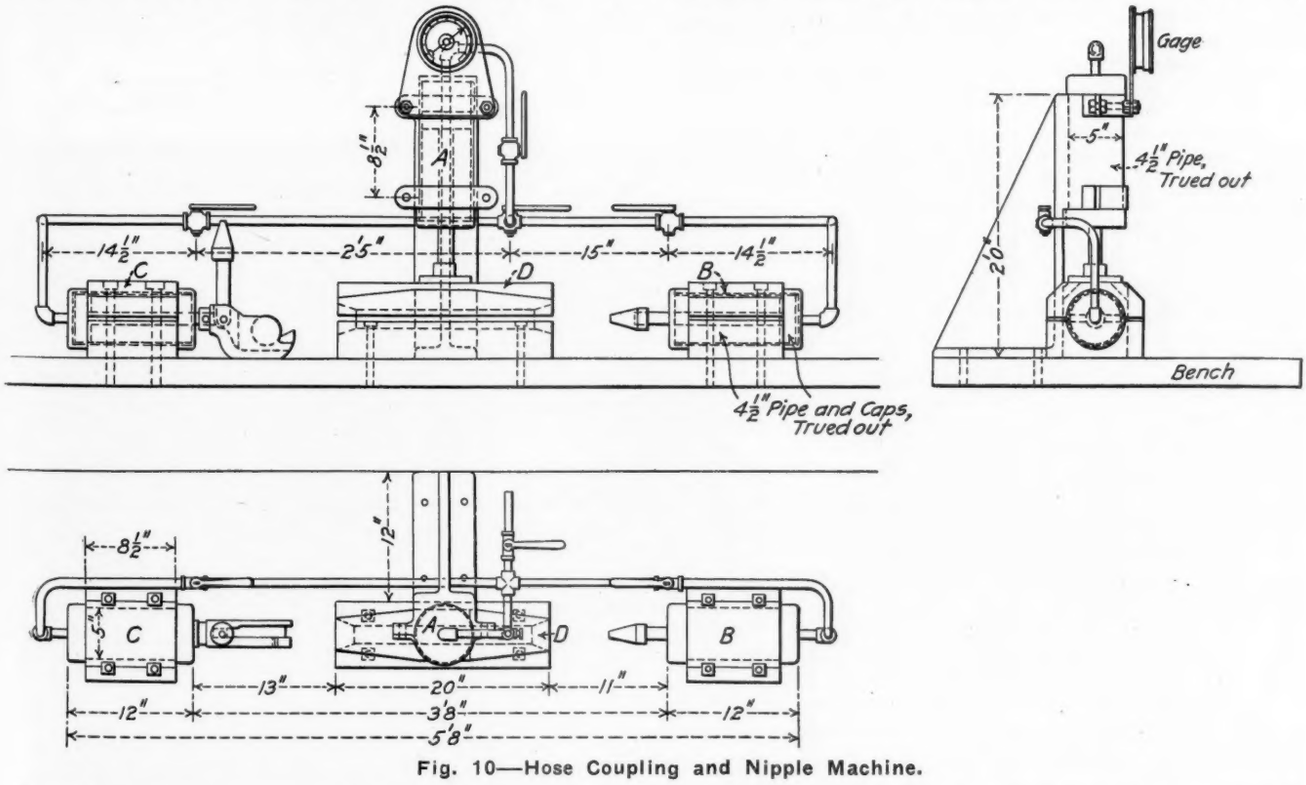


Fig. 10—Hose Coupling and Nipple Machine.

the jacks under a coach, wooden filler blocks of sizes such that they will just go under the car bolsters, are used. As several lengths of these filler blocks are kept on hand, any height may be obtained without using additional blocking. The car is then raised to the position shown in the upper illustration and the truck is run out. One of the walking-beam chains is attached to the truck frame and the other to the coupler shank.

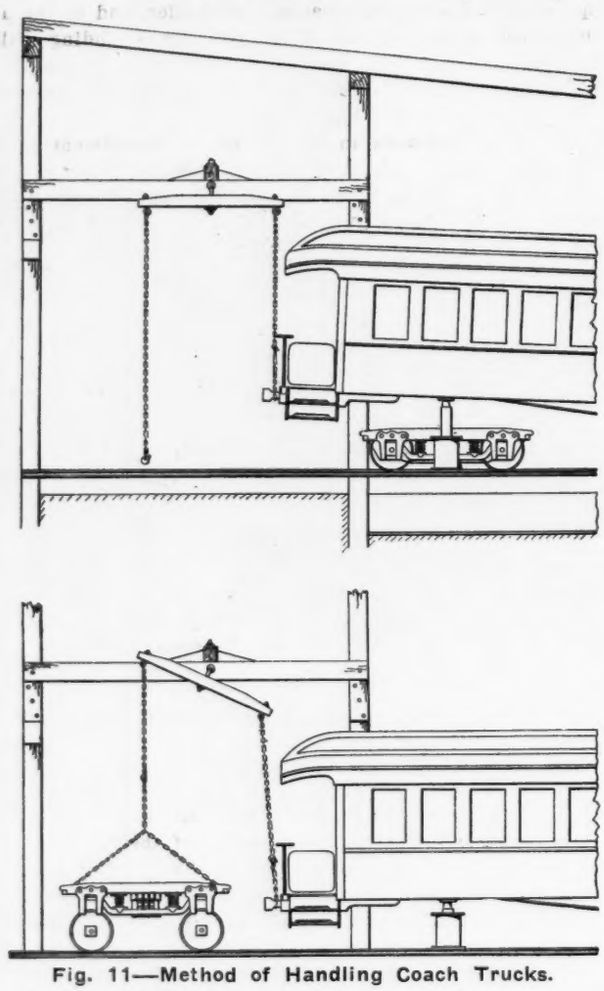


Fig. 11—Method of Handling Coach Trucks.

The coach is then lowered and its weight acts to raise the truck from its wheels.

The coach is allowed to stand on the jacks while the wheels are being changed, the entire job being the work of one man. We are indebted to H. Ashley, master mechanic, W. P. & Y. R., for the drawing and data.

LARGE MILLING CUTTERS.

The shops of the Eastern Railway of France are using some large milling cutters of both solid and inserted tooth design. The accurate making of a large milling cutter is usually considered very difficult. In this shop, cutters are made 10 in. in diameter by 16 in. long, weighing 400 lbs. When inserted teeth are used, there is a solid soft steel hub in two parts fitted with spiral steel blades. The two parts of the hub are placed end to end, and each blade is made in two pieces, set lengthwise of each section.

BY JAMES STEVENSON,

Foreman, Pennsylvania Railroad Shops, Olean, N. Y.

REMOVING DRIVING-BOX CELLARS.

A method of removing tight-fitting driving-box cellars without damaging them, as is the case when using a sledge hammer, is shown in Fig. 12. The boxes are first rolled over on the axles. The apparatus is swung above the axle from a traveling air hoist and the fulcrum of the lever, made in the form of a double clamp and bolted at the bottom, is fastened to the axle. The U-shaped piece of metal is then placed in position, bearing against the box only, after which the cellar bolts are removed. The other box is used for a foundation for the air

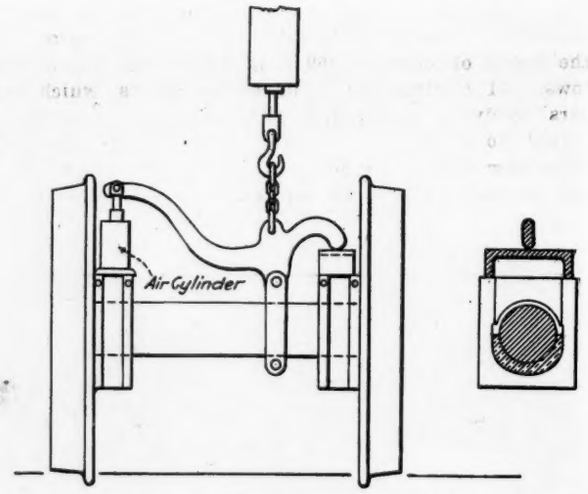


Fig. 12—Method of Removing Driving-Box Cellars.

cylinder. When the air is applied the box is forced down and off of the cellar, which latter is used as the cylinder foundation when removing the opposite box.

TRUCK SIDE MOVEMENT INDICATOR.

A method of obtaining a card or diagram of the side movement of a locomotive truck is shown in Fig. 13. A bracket is bolted to the truck side frame on the center line of the truck. This bracket should be sufficiently long to project some distance ahead of the cylinder so as to clear it at all times. The

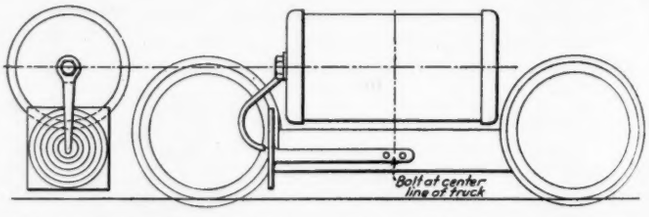


Fig. 13—Truck Side Movement Indicator Arrangement.

bracket carries a 12 x 12-in. board, on which is placed a card having 1-in. graduations by concentric circles.

A piece of ¼-in. pipe is bent to the shape shown, and one end is fastened at the cylinder head stud and the other provided with a pencil, which bears against the diagram sheet. When the locomotive is standing on straight track the pencil should touch the center of the diagram. Lateral movements of the truck, while running, will be recorded, and in case of alterations for side movement, their effects can be noted.

A consular report says that a concession granted by the government of Honduras early in 1909 for constructing a railway from Iriona, on the Atlantic, to the inland city of Juticalpa, and embracing the option of extending lines to Tegucigalpa and the Pacific port of Amapala, was financed in Chicago, with a capital of $5,000,000, and incorporated under the laws of the state of Delaware as the North & South Interoceanic Railroad. Engineers have completed the location survey to Juticalpa, 144 miles, and grading for a standard-gage road was begun in October last. The work involved is of considerable magnitude, as it is intended to jetty the mouth of the Gualaya river, on which Iriona is situated, and deepen the channel to a depth sufficient to enter vessels drawing 30 ft.; to lay out a town site with proper drainage, install water and electric-light plants, and erect a wireless station.

CAR REPAIR SHOP NOTES FROM THE DELAWARE, LACKAWANNA & WESTERN AT EAST BUFFALO.

BY ROY V. WRIGHT,
Mechanical Department Editor of the *Railway Age Gazette.*

The car repair plant of the Delaware, Lackawanna & Western at East Buffalo employs about 250 men. During the month of March 11,769 freight cars were repaired as follows: 31 received No. 1, or heavy repairs, which includes cars receiving longitudinal sills and other repairs; 35 received No. 2, or heavy repairs, which includes cars that receive new roofs, together with any of the following: New end or ends, floor, draft timbers, end sills, bolsters, needle beams, new sides, new inside lining, post or braces, side plates and end plates, or any two of these items that require 16 hours or more to renew; 349 received No. 3, or ordinary repairs, including any one of the items mentioned above that requires more than 10 hours or less than 16 hours to renew; 11,354 received light repairs, which is equivalent to repairs that can be made by one man in less than 10 hours.

Fig. 1—Freight Car Repair Shop.

Only light repairs are made to steel cars at this point, cars requiring heavy repairs being sent to the shops at Keyser alley. Passenger equipment that lays over at Buffalo is cleaned at the East Buffalo shops and any light repairs are made that may be necessary.

The car repair plant is in direct charge of the general foreman of the division, C. G. Anderson, who reports to B. H. Hawkins, the division master mechanic. We are indebted to T. S. Lloyd, superintendent motive power and equipment; J. C. Fritts, master car builder, and to the above mentioned gentlemen and their assistants, including William Anthony, mill foreman, and Martin Hoffman, car repair foreman, for assistance in gathering the data for this article.

NEW CAR SHOPS.

At present the work in the car repair department is being carried on under difficulties, as a new shop is being built to replace the mill, car shop, etc. The building is almost completed and the equipment will be installed within the next few months. It is 84 ft. wide and 484 ft. long; one end, about 200 ft. long, will be used for the mill, offices and for lumber storage; the other end will be used for freight car repairs and will have a capacity for 20 cars, or five on each of the four tracks. There is a lorry track between each pair of repair tracks. The space between the rails of each track is filled with concrete; the rest of the floor in the car repair end will be of wooden blocks. A general idea of the construction of the building may be obtained from the interior and exterior views and the diagram of the cross

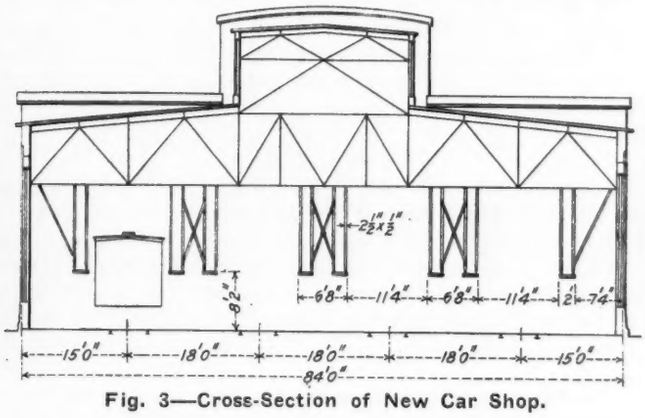


Fig. 3—Cross-Section of New Car Shop.

Fig. 2—Interior of New Freight Car Repair Shop and Mill.

section, as shown in Figs. 1, 2 and 3. The roof trusses are heavier in the mill end of the building because of having to support the electric motors and the countershafs for the machine tools. The walls are of brick resting upon a concrete foundation. The ends of the steel roof trusses rest on the brick pilasters. The roof is of reinforced concrete 4 in. thick and is covered with four layers of tar paper and a slag roofing. The building will be heated by steam, the radiators being placed along the side walls underneath the windows. Compressed air and other piping is carried overhead on the roof trusses. Arc lights will be used for lighting the car repair end of the shop and a combination of arc and incandescent lights will be used in the mill end. The large window area in the side walls and the skylights provides splendid daylighting.

NUMBER OF WORKMEN ON A CAR.

The men work in gangs of two men each and are divided into two classes, truck men and carpenters. The truck men do the work on the trucks, underframe and draft rigging; the carpenters do all the work on the roof, sides and floor of the car. Except in emergency, not more than four men can work on one car at the same time—a truck gang and two carpenters.

LOCKERS FOR THE MEN.

An expanded metal locker is provided for each workman in the shops and the repair yard. These lockers are placed in the freight car shop and are 1 ft. wide, 1 ft. deep and 5 ft. high inside. They are examined three or four times a week to see that no inflammable material is allowed to accumulate in them. They were manufactured and furnished by Merritt & Co., of Philadelphia.

WORKMEN'S TOOL BOXES.

Considerable friction developed at one time because of the workmen stealing tools from each other's boxes. These boxes are of the usual type, 12 in. x 7½ in. x 24 in. over all, with half of the top and half of one side open. To overcome the difficulty three compartments or closets were built in one corner of the freight car shop, each about 9 ft. long and containing two shelves, making three divisions in each. Each workman's tool box is numbered and must be put in a certain place in one of the compartments when he finishes his work in the evening. The man in charge locks the compartments when the boxes have been placed in them. If any of the men work overtime, the night watchman sees that the boxes are properly put away. In the morning the men take out their boxes when they start to work and if any boxes remain the compartment is locked so that the contents cannot be tampered with. This scheme is giving splendid results.

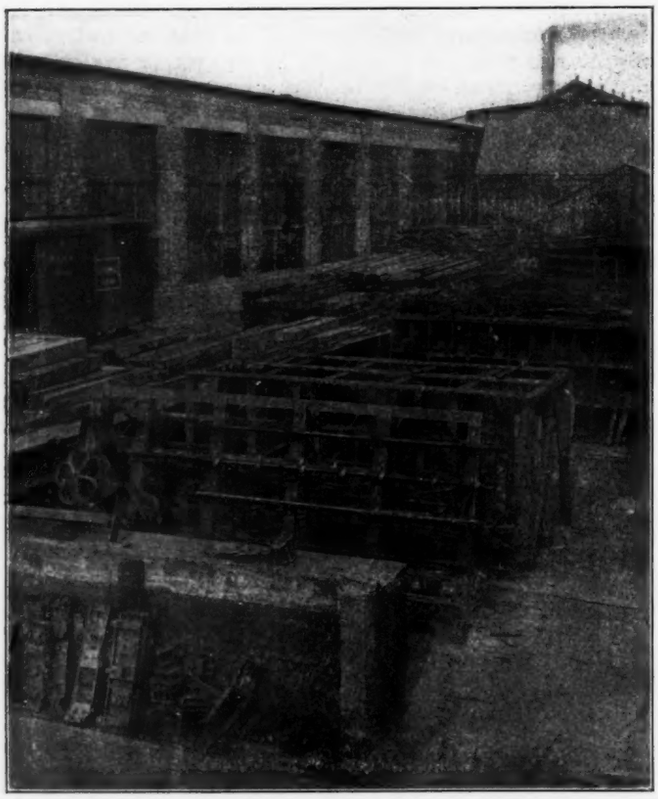


Fig. 4—Platform for Material Reclaimed from Scrap.

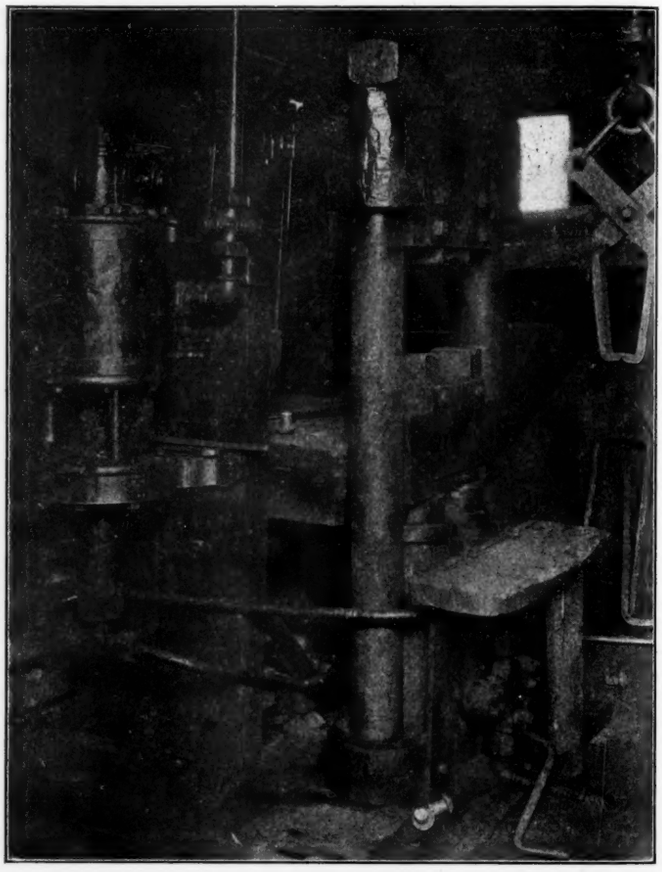


Fig. 5—Hydraulic Press for Shearing Off Coupler Yoke Rivets.

RECLAIMING MATERIAL FROM SCRAP.

All scrap material gathered on the division is shipped to the East Buffalo shops and sorted into different classes. It is carefully examined by an expert and such parts as are fit for use are transferred to what is known as a second-hand platform, which is partially shown in Fig. 4. When material is taken from this platform no charge is made against the car for it. At one end of the platform is a shed containing a hydraulic machine for cutting off the coupler yoke rivets; beyond this is a small blacksmith shop where bent or broken parts are straightened and repaired, and yokes are riveted to couplers.

HYDRAULIC PRESS FOR SHEARING COUPLER YOKE RIVETS.

A hydraulic press, or shear, designed at the East Buffalo shops has recently been installed for shearing off coupler yoke rivets and is giving satisfactory results. The rivets are sheared at both ends where the yoke fits against the coupler. The body of the rivet drops out of the coupler end, and the two ends of the rivet either drop out, or may be easily knocked out, of the yoke. The disadvantage of most devices designed for doing this work is that they cut the rivet head off at one end only, and if both of the rivets are not headed up on the same side, it is almost impossible to drive one of them out. With this machine, although the work is done

quickly, there is no danger from flying parts as with a drop machine. The apparatus is shown in detail in Figs. 5, 6, 7 and 8. The columns of the machine are forged from old axles. The coupler is raised by an air hoist on a gib crane and the yoke is slipped into place as shown in Fig. 8. Water is admitted to the cylinders by the three-way cock (Fig. 7) and the ram is raised so that the coupler is forced against the top die, or former, as shown in Fig. 8. By means of the three-way cock the connection to the main water supply line is then cut off and the pressure in the cylinders is increased by starting up a 9-in. locomotive air pump, the lower part of which has been bushed down to $\frac{15}{16}$ in. and is connected by a T and two check valves to the water supply line and the cylinders of the press. From 10 to 14 strokes of the air

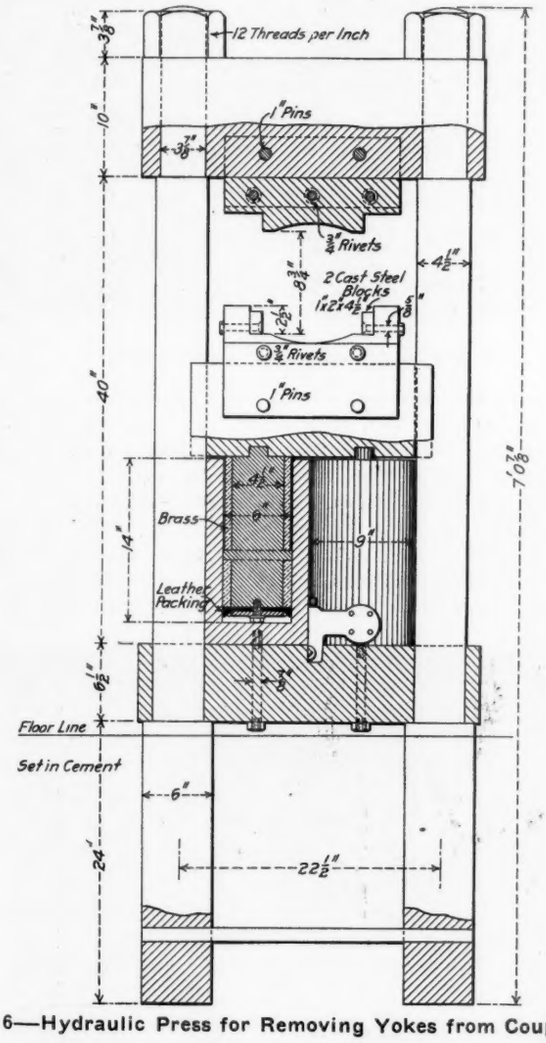


Fig. 6—Hydraulic Press for Removing Yokes from Couplers.

pump are required to increase the pressure in the cylinders sufficiently to shear off the two 1⅛-in. rivets at both ends. The air pump is then shut off and just enough water is drained from the cylinders to allow the yoke and coupler to be removed and another one to be slipped into place.

MAKING BOX CAR DOORS.

Accuracy and rapidity in the building of box car doors is secured by the use of a cast iron plate 3¾ in. thick and 7 ft. 3 in. wide by 8 ft. 6 in. long. On two sides, at right angles to each other, are flanges 2 in. high, as shown in Fig. 9. The door frame is laid on the plate, as shown by the photograph, and the siding is placed on it and nailed to it. Near the back of the plate will be seen what appears to be a boss with a handle on it. This is a cam which fits into a cavity in the plate; it was intended by turning the handle to force the siding boards tightly against each other and hold them there while they are being nailed on the frame. There were three of these cams. This practice has been discontinued, however, as it has been found that the dry lumber, when it becomes exposed to the rain and moisture, swells, with resulting injury to the appearance of the door. Underneath the table are a number of bins containing all of the necessary nails, castings, screws, etc.

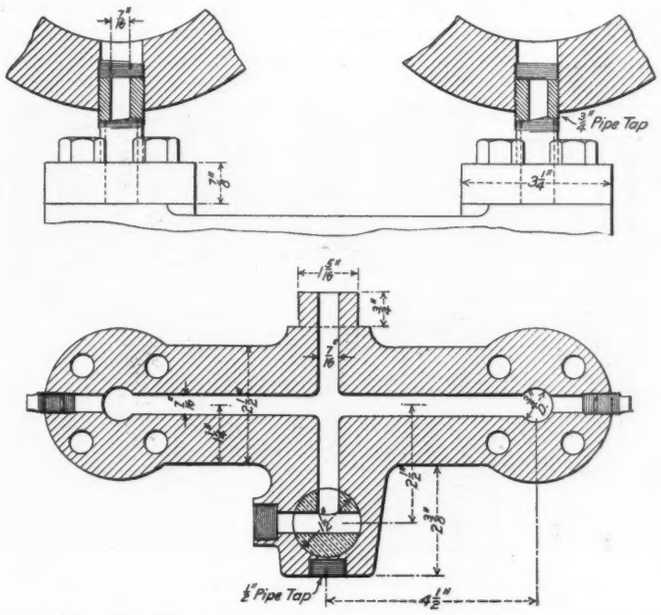


Fig. 7—Three-Way Valve on Hydraulic Press.

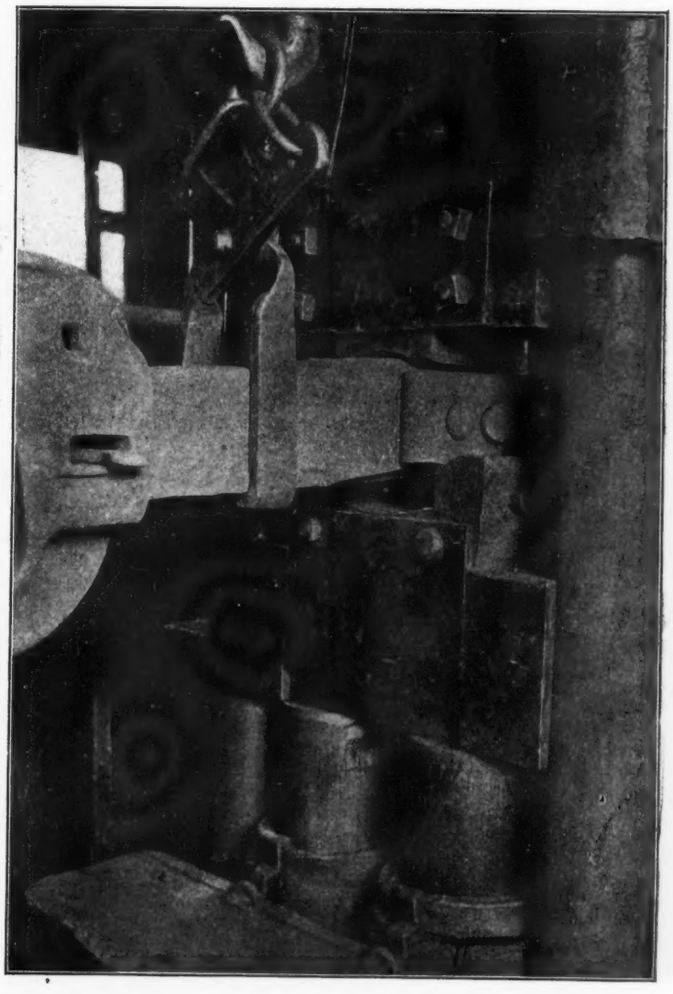


Fig. 8—Coupler Yoke Rivets About to be Sheared.

REPAIRING FLOORS OF GONDOLA CARS.

In repairing or replacing the floors on wooden gondola cars it is necessary to remove or raise the sides or box out of the way. To economize space in the freight car shop an ingenious arrangement has been provided for hanging the box up out of the way above the car. As shown by the photograph, Fig. 10, ⅞-in. rods are hung from I-bolts in the

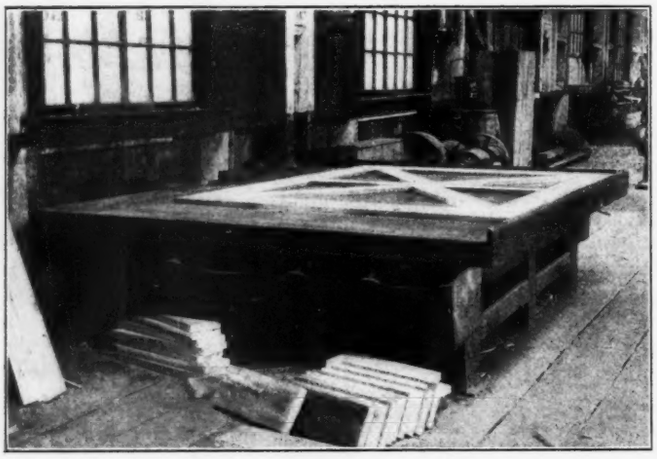


Fig. 9—Iron Table for Building Box Car Doors.

wooden roof trusses. These rods are upset at the lower end and formed into a hook 1¼ in. square in section and 3 in. wide. The sides of the car are loosened from the under frame and pried up a couple of inches. The car is then jacked high enough so that the hooks, two on each side, may be placed under the sides. The underframe is then lowered, leaving the sides hanging in the air.

JACKING UP LOADED CARS.

All of the jacking up and lowering of loaded cars is done by two men with two air jacks; these are shown in position at one end of a loaded car in Fig. 11. The inside diameter of the air cylinders is about 20 in. and the stroke is 22 in.; the piston rods are 4 in. in diameter. The air supply for both cylinders is controlled by one valve, so that the pressure

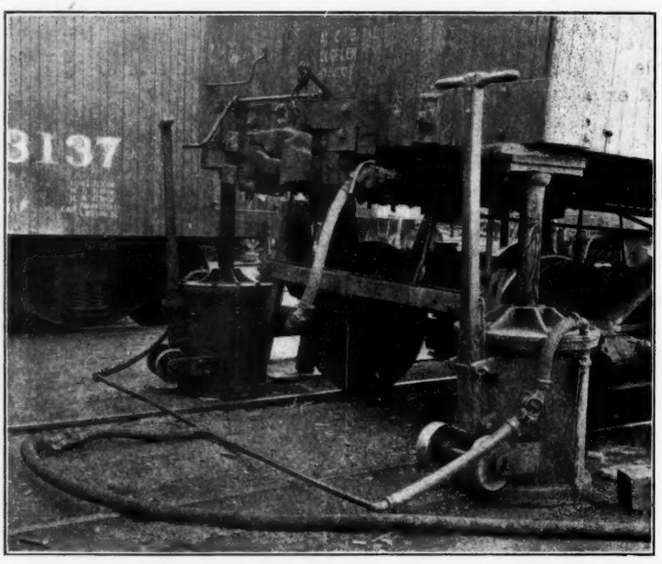


Fig. 11—Air Jacks for Loaded Cars.

is equalized and both jacks work together. While the jacks are quite heavy, the men seem to have no trouble in handling them about the yard. The light cars are jacked up by ratchet jacks by the gang of men working on tne car.

PREPARING PACKING FOR JOURNAL BOXES.

The method of preparing the packing for journal boxes is especially good. The waste must soak in the oil for not less than 24 hours and must contain four pints of oil to each pound of waste. This proportion was determined upon after

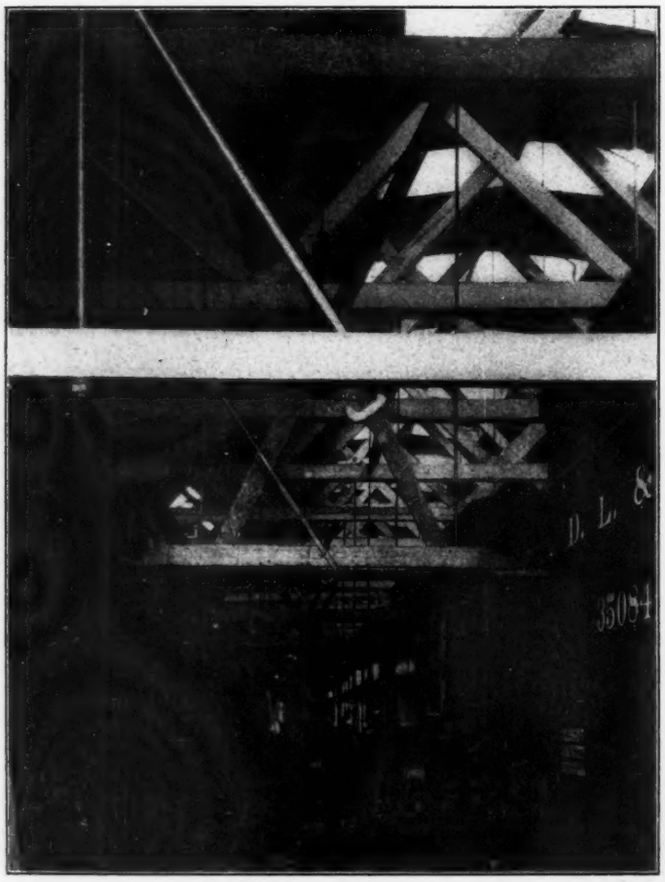


Fig. 10—Hooks or Hangers for Supporting Gondola Sides.

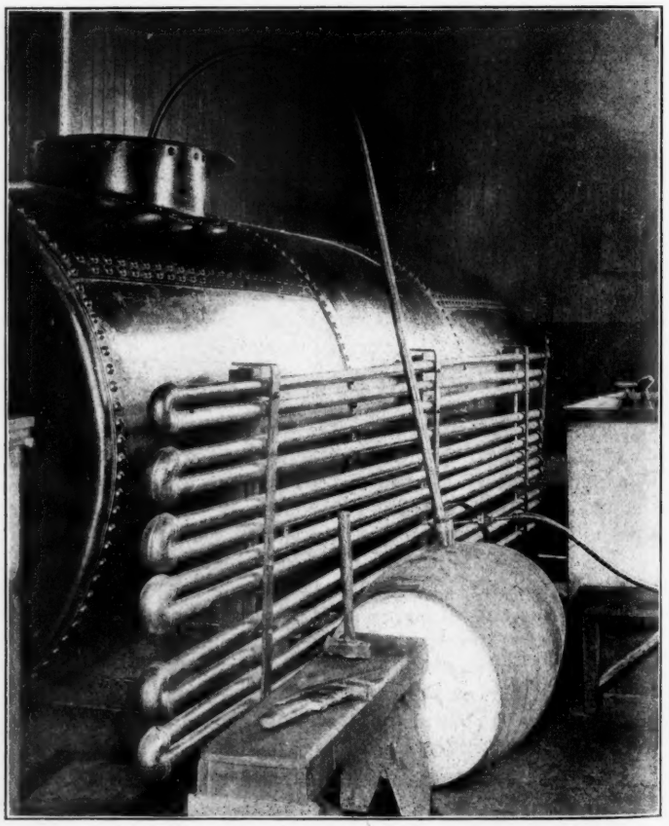


Fig. 12—Storage Tank for Journal Packing Oil.

considerable practical experimentation. Five pints and four and a half pints to each pound of waste were tried and found to be excessive. The waste is stored in a compartment, or bin, 7 ft. x 5½ ft., which may be extended by slats as high as is necessary. The oil is received in barrels and is forced by compressed air into a tank having a capacity of 36 barrels, or about 1,800 gals. To do this the bung is removed from the barrel and a brass plug is screwed in the hole. A piece of 1¼-in. pipe slips through a hole in the plug and extends to the lower side of the barrel. The upper end of this pipe is bent over and drops down into the manhole of the large tank, as shown in Fig. 12. The air enters the top of the barrel through a ½-in. pipe in the brass plug. A rubber gasket on the large pipe at the top of the brass plug prevents the air from escaping at the joint. The maximum air pressure is automatically controlled, so that there is no danger of bursting the barrel. The steam pipes alongside the tank keep it warm and heat the room in cold weather.

On the other side of the room are five tanks (Figs. 13 and 14) constructed of ¼-in. steel, 32 in. in diameter inside and 36 in. high. These are supported on 9-in. I-beams resting on the concrete floor. To prepare the packing 90 gals. of oil are run into one of these tanks, and to this is added 80 lbs. of wool waste, the latter being put in carefully in order to saturate it thoroughly with the oil. This mixture is allowed to stand not less than 24 hours. At the end of that time, or when the waste is needed, the globe valves in the 1½-in. pipe at the bottom of the tank are adjusted so that the surplus oil can drain into an empty tank. When the height of the oil has reached about the same level in both tanks, as determined by putting a measuring stick down through the vents at the sides of the tanks, the ⅝-in. plate or piston is pressed down on the waste until 50 gals. of oil have been forced into the second tank. The oil is measured by a measuring stick properly calibered. The packing then contains 40 gals. of oil, or four pints to each pound of waste, and is ready for use. As shown by the drawing, each tank contains a cast iron strainer near the bottom.

The lower head of the air cylinder is a casting and has two arms which extend down over the sides of the tank. Each of these is riveted to a ½-in. plate, which has a flange 25 in. long extending under the horizontal members of the 4-in. x 3-in. x ½-in. angles, which are riveted to the sides of the tanks. These angles are tied to each other at the ends and between the tanks by 3½-in. x ⅝-in. iron braces, which are turned over at the ends and riveted to the angles. When the cylinder is not exerting pressure it rests on four 4-in. rollers,

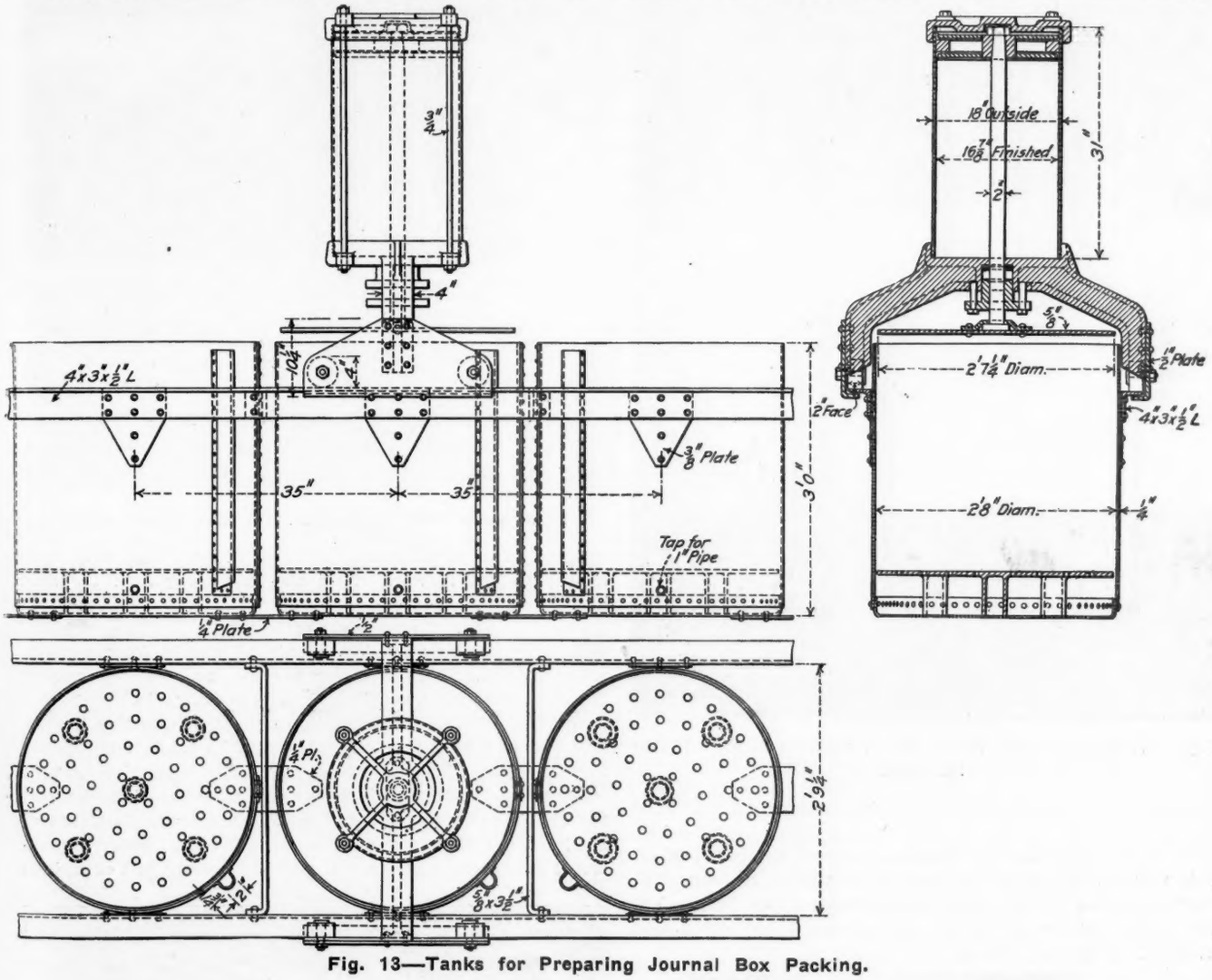


Fig. 13—Tanks for Preparing Journal Box Packing.

2 in. wide, which run on the top of the angles; the cylinder can thus be moved easily from one tank to the other. Air is admitted to either side of the piston by means of a three-way cock. The cylinder is constructed of a piece of pipe, 18 in. outside diameter, which screws into the two cast iron heads. In addition to this the heads are tied to each other by four ¾-in. rods. The cylinder has a stroke of about 27 in., the piston rod being 2 in. in diameter.

Oil is transferred from the storage tank to the smaller tanks in the following manner: A small tank holding 20 gals. rests on the floor at one end of the storage tank and below it. The oil is allowed to flow into this small tank by gravity and when it is filled the connection to the storage tank is closed. By admitting air to the top of the 20-gal. tank, all of the oil can be forced out of it into any one of

the other tanks in a few moments; it is delivered to the tanks through the spigots shown in Fig. 14.

The prepared waste is transferred to a galvanized iron vat 30 in. x 60 in. x 30 in. high. This contains a strainer at the bottom and the surplus oil is drawn off from time to time and sprinkled back over the top of the waste. The waste is also handled about occasionally to make sure that it is as nearly uniformly saturated with oil as possible.

TRESTLE FOR SUPPORTING CARS.

An especially good trestle is used for supporting the car bodies; it is substantial, durable and may be placed so that it will clear the trucks, allowing them to be run out from under the car. One of these trestles is shown in Fig. 15. The base is made in the form of a T, the long member being placed

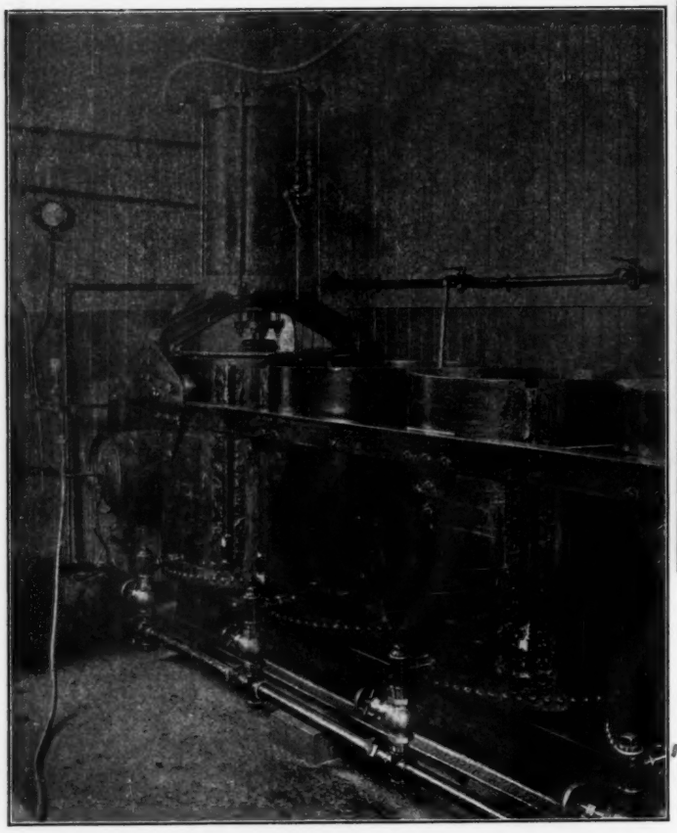


Fig. 14—Tanks and Press for Preparing Journal Box Packing.

nearest the car and parallel to it. The trestle is constructed entirely of 1¾-in. x 6-in. timbers, except for a 1¾-in. x 3-in. piece which ties the legs together at the front and about half way up. The base plank at the front is 3 ft. long. The rear leg extends back 2 ft. from the front of the trestle. The flat surface at the top is 5¼ in. x 10½ in. and the trestle stands 3 ft. 10 in. high.

TRUCK FOR MOUNTED WHEELS.

Between each pair of standard gage tracks in the repair yard is a lorry track. By the use of the truck shown in Fig. 16 mounted wheels may be transferred about the yard over these tracks. The wheels of the truck are 15 in. in diameter and the axles have 1⅝-in. journals. The body is made up of two pieces of 3-in. x 10-in. plank, 5 ft. 9 in. long. That part upon which the wheels run is protected by a steel plate, except for a space at the middle, which is scooped out slightly to prevent the wheels from rolling off.

When these trucks cannot be used, or where it is necessary to have trucks for pulling the mounted wheels under the car, the two small trucks, shown in Fig. 17, are used. To lift the mounted wheels it is only necessary to back these trucks underneath the journals and bear down on the truck handles. The 10-in. wheels are 3 in. wide. The 2½-in. x 12-in. wooden block, on which the journal rests, is supported on a 1-in. x 2½-in. piece of iron, which is turned at each end to provide the truck journals. The wooden block is covered with a copper plate where it comes in contact with the

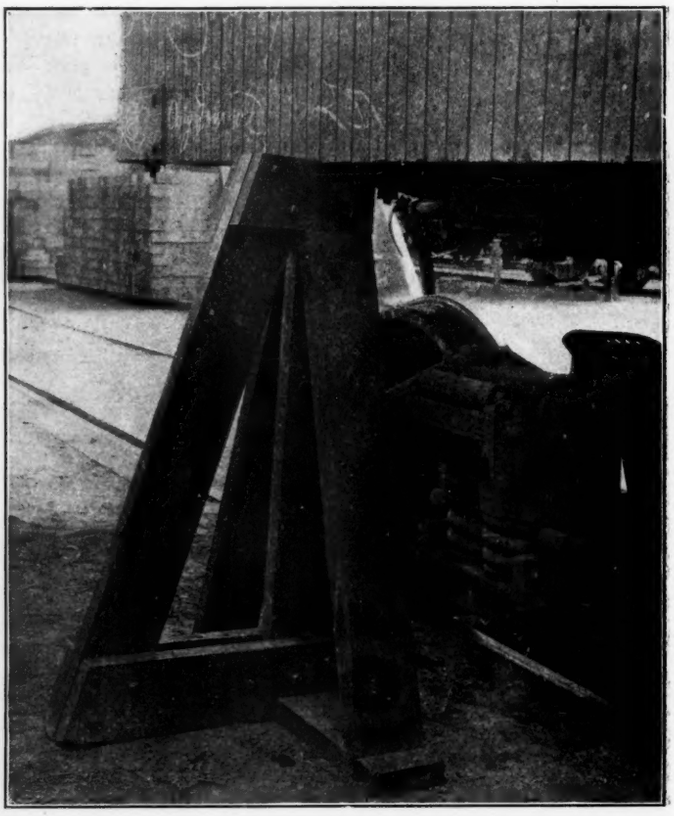


Fig. 15—A Good Trestle for the Car Repair Yard.

journal. The truck handle is made of 1-in. iron rod. One man pulls the forward truck and another pushes the rear one.

DROP PIT FOR WHEELS.

A drop pit for removing a pair of wheels from a truck without taking it from under the car, and without raising the car except for a couple of inches, is shown in Fig. 18. It is quite similar to the drop pits often used in engine houses. The car is placed with the wheels to be taken out directly over the pit; when not in use the pit is covered over with loose planks. The car is jacked up a couple of inches and the air brake levers, brake shoes and the lower tie straps of the truck are disconnected. The air jack is run under the center of the axle and the pair of wheels is raised just enough to

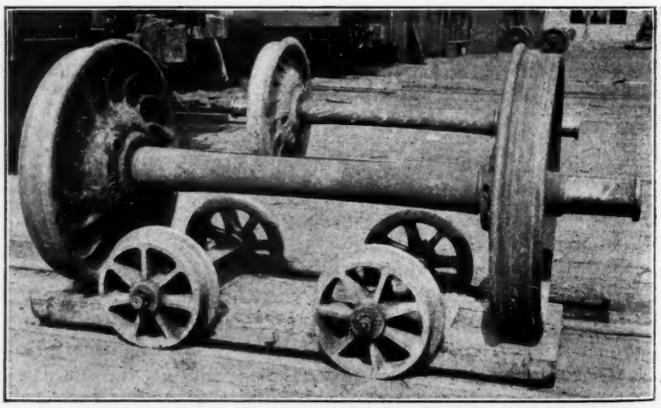


Fig. 16—Truck for Transporting Mounted Wheels on Lorry Tracks.

allow the sections of the track over the pit to be disconnected and pushed aside. The wheels are then lowered into the pit and the truck is pushed to one side; the wheels are raised and rolled off alongside the car. Another pair is lowered into the pit and placed under the car. The cylinder of the air jack is 12 in. in diameter and has a lift of about

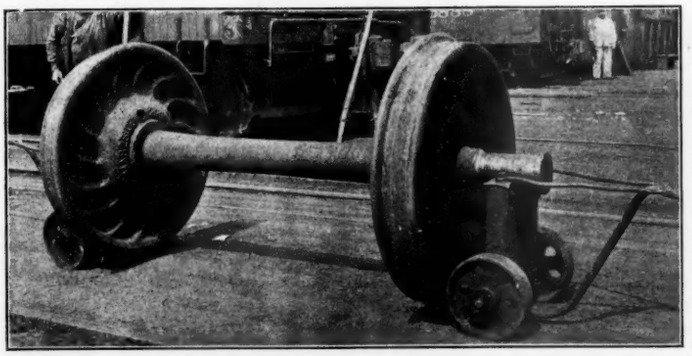


Fig. 17—Trucks for Transporting and Pulling Mounted Wheels Under Car.

4 ft. The pit is 48 in. wide at its upper portion, which is 42 in. deep. The lower part of the pit into which the air cylinder projects is about 21 in. wide and 48 in. deep. Twelve-inch wheels, placed 36 in. apart lengthwise, center to center, are used on the truck.

CRANES FOR HANDLING MATERIAL.

Several types of cranes are used for handling material about the yard. In Fig. 19 is shown a revolving crane on a truck; it is used for various purposes, including the handling of wheels, axles, etc. In the background of the same view is shown a gib crane with an air hoist for handling wheels. A large air operated crane placed on a flat car is used for loading and unloading heavy material. The division wrecking crane is located at this point and is also available for handling heavy material.

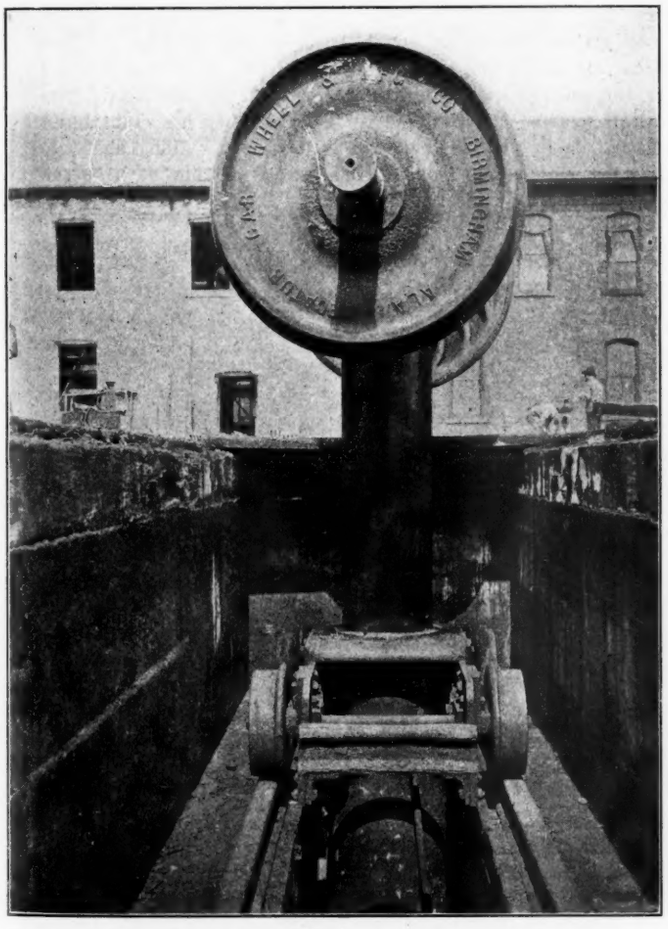


Fig. 18—Pneumatic Hoist in Wheel Drop Pit.

FIRST AID TO THE INJURED.

A few years ago a number of the workmen decided to chip in and buy a few medical supplies, which were placed in charge of one of the young men in the office. When the matter was brought to the attention of the company it immediately undertook to supply the necessary material for "First Aid to

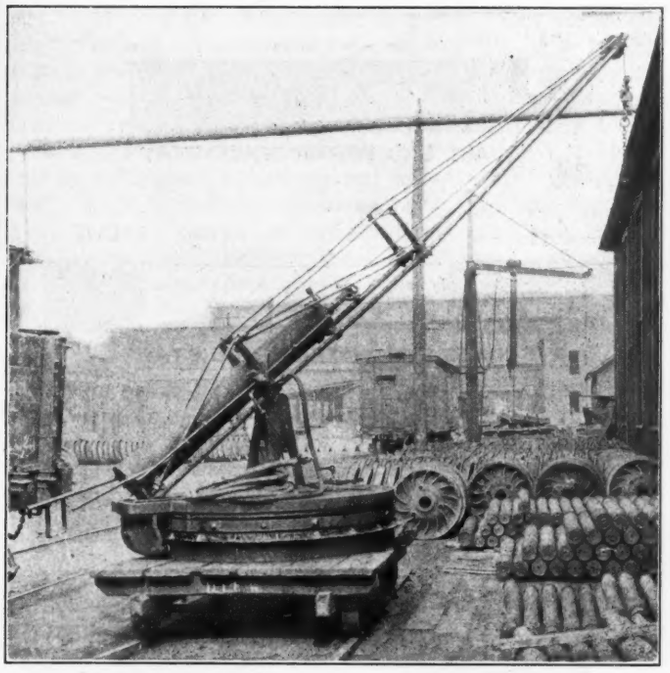


Fig. 19—Cranes for Handling Wheels and Axles.

the Injured." The men, however, have continued their support, the funds contributed by them being used for supplies for relieving such troubles as headache, earache, stomach troubles, etc., which do not properly come under the head of injuries. There is no question but what a case well filled with material for treating injuries, and in charge of men properly instructed as to its use, will pay for itself many times over in the course of a year, or even a few months, if the question is considered from a financial standpoint only.

THE NICARAGUA NATIONAL RAILWAY.

There is only one railway in operation in Nicaragua. It traverses a comparatively small district in the extreme western portion of the Republic and, including its several branches, has a total length of 171 miles. About 20 miles of the southeastern end of this railway penetrates into one of the principal coffee-growing sections of Nicaragua, a somewhat mountainous region, the highest point of which is 1,644 ft. above the sea level. With this exception the road runs through comparatively low and unbroken country, devoted chiefly to agricultural and stock-raising industries.

The gage of the road is 42 in., and the weight of rails 30 to 40 lbs. The road was built by sections, covering a period from 1884 to 1903. Its present general condition, due to defective construction work and inadequate upkeep, is bad. The rolling stock is limited in amount and of an inferior order, and the service, both passenger and freight, is poor.

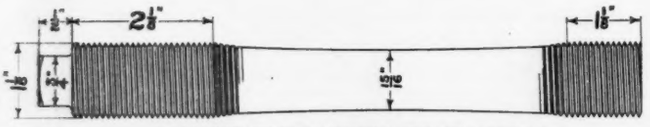
The road is the property of the Nicaraguan Government, but on December 26, 1903, it was leased for a term of 10 years to a citizen of Germany. This contract provides that of the earnings of the road 25 per cent. shall be paid to the Nicaraguan Government, 10 per cent. shall be devoted to repairs, and the residue, 65 per cent., shall go to the holder of the lease, who must pay therefrom the expenses of operation.

FINISHING STAY-BOLTS AND STRAIGHT AND TAPER BOLTS FOR LOCOMOTIVES.*

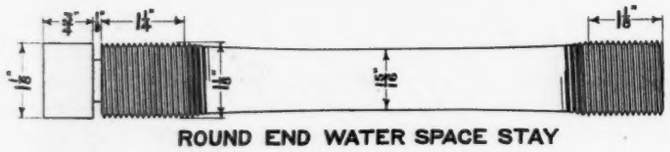
BY C. K. LASSITER,
Mechanical Superintendent, American Locomotive Company.

The locomotive boiler of average size contains about 1,500 staybolts, the number varying from 1,200 in the smaller sizes to 2,000 or more in the heavier types. They vary in length from 4¼ in. to 10½ in. for the water-space bolts, which constitute about 75 per cent. of the total number, to about 28 in. for the radial and crown bolts. Probably no part of the boiler

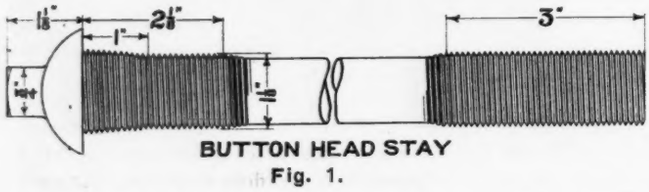
SQUARE END WATER SPACE STAY



SQUARE END WATER SPACE STAY



ROUND END WATER SPACE STAY



BUTTON HEAD STAY

Fig. 1.

is subject to more destructive conditions than these small staybolts. The most serious strains are those due to expansion and contraction of the inner sheet, which bends the bolts and causes them to break close to the outer sheet. This is especially true of the side or water-space stays, which are comparatively short and have very little flexibility.

The material used is a high grade of refined iron, close-grained and tough. The pitch being very important on account of entering the second sheet, these stays were formerly cut to length from the bar, drilled for centers and threaded on engine lathes. The center-drilling was not always concentric and considerable time was required to center the rough bolt so that a good thread could be obtained. This method proving too expensive, bolt cutters were used for the work, but the results were not entirely satisfactory. It was difficult to cut the threads full and smooth with one passage of the chasers and the second passage was taken at the sacrifice of pitch, as well as of time, because there was not enough material to remove to carry the chasers along properly. The introduction of the lead screw in bolt cutters brought about a very considerable improvement in pitch, but still there was trouble in getting the thread smooth for the reason that the chasers were not always as accurate as the lead screw, under which conditions the threads would be rough or torn.

About thirty years ago the idea was conceived of concaving the bolts or reducing them in the center below the root of the thread, the object being to provide flexibility to compensate for the expansion between the inner and the outer sheets. Laboratory tests showed that a bolt reduced in the center would withstand about twice as many vibrations before breaking as one on which the threads were left straight for the full length. For many years it was the accepted practice to reduce a bolt in diameter on engine lathes after it was threaded in the bolt cutter and drilled for centers.

In 1900, Alonzo Epright, an engineer in the employ of the Pennsylvania Railroad, designed machines which were fully automatic in that they made from the bar, threaded and concaved, all diameters of side stays up to 10 or 11 in. in length. The author has no knowledge of the production of these machines and therefore can make no comparison of costs.

The vertical type of machine for threading these bolts was used to some extent and it seemed that if the proper chaser could be made the best results would be obtained from this type of machine because the weight of the head would assist the chaser to give an accurate pitch. In the horizontal or bolt cutter type the chaser must carry along the vise and carriage to the detriment of accuracy in the lead. Also, the flow of oil would assist in washing away the chips, which were troublesome in the horizontal machine. Furthermore, the vertical type of machine is more convenient to operate, one man attending six or eight spindles with ease.

After a great deal of experimenting a die head was developed in which, with chasers properly ground, the limit of accuracy of 0.01 in. in 8 in. can be maintained without the use of the lead screw, which is more nearly a perfect pitch than many staybolt taps in daily use. Where a proper lubricant is used a very fine, smooth thread can be obtained at a uniform cutting speed of 20 ft. per minute. The turning or reducing tools are shown in Fig. 2, the cutting points being visible at the center, back of the chasers. To these tools are attached the crossheads *KK*, which are actuated by profilers or formers passing through the spaces *LL*, over which the head is drawn by the chaser, the staybolt acting as a lead screw.

The staybolt-threading machine is shown in Fig. 3. The several die heads are attached by small rods to straps passing over the pulleys on a shaft at the top of the machine. The operator grasps one of the strap handles with his right hand and, by the aid of the rotating pulley over which the strap passes, raises the die head until it comes in contact with the

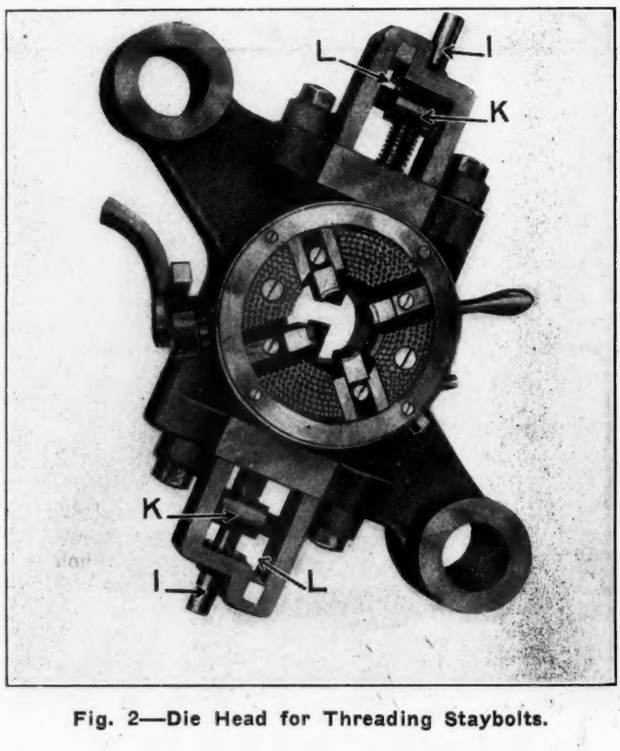


Fig. 2—Die Head for Threading Staybolts.

*Presented at the spring meeting of the American Society of Mechanical Engineers, at Atlantic City, May 31-June 3.

bracket which closes the die. With his left hand he places the squared end of a staybolt in a holder underneath the die and allows the head to drop until the chasers begin to cut, when he moves to the next die head and repeats the operation. By the time he has placed all the heads in operation,

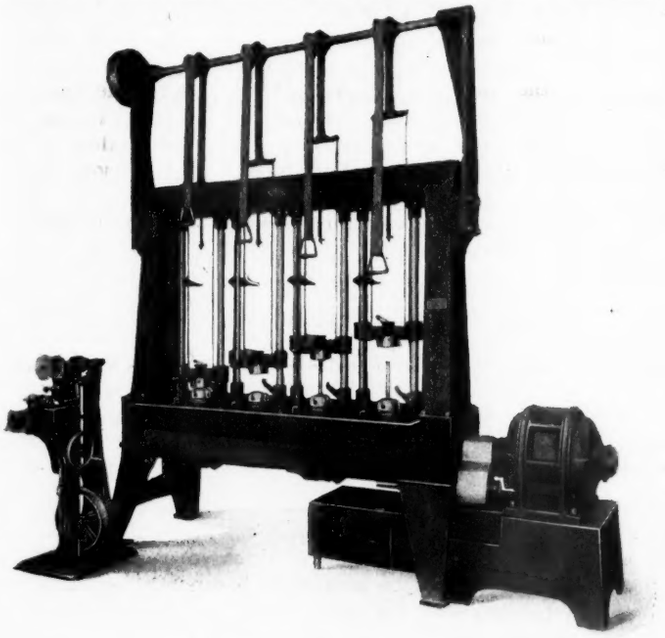


Fig. 3—Staybolt Threading and Reducing Machine, with Special Grinder for Cutting Tools.

the first bolt is finished, the die having dropped automatically when the threading was completed. In Fig. 3, the die head at the right is shown raised sufficiently to insert the staybolt in place; the next at the left is just beginning to thread the bolt and the two other die heads are in still lower positions.

A comparison of costs by the two methods, taking a 7½-in. side stay as an average length, is about as follows:

Former Practice.

Threading in bolt cutter, usually taking two cuts at 20 cts.	$0.40
Drilling for centers	.22
Concaving or reducing on engine lathe	.75
Cost per hundred	$1.37

Present Practice.

Present cost, threaded the entire length or threaded and concaved for all sizes and lengths, per hundred	$0.13

Using the average number of stays, a saving of labor cost of $18.60 per boiler is obtained with a minimum of rejected stays.

METHODS OF DRILLING STAYBOLTS.

The telltale holes which are drilled in the staybolts have been the cause of considerable expense and annoyance. Some railways drill them after the stays are placed in the boiler, with pneumatic hand drills. Under these conditions there is danger that the hole may not be central. It often happens that the drill runs through into the water space or is broken off in the hole. In either case it is necessary to remove the bolts and put in others. Sometimes the holes are drilled on a vertical drilling machine before being placed in the boiler. Even then the breakage of drills is very large, averaging about 16 to the boiler, and each broken drill means a staybolt thrown away. An automatic machine has been devised for drilling these holes before the stay is placed in the boiler. The staybolts are fed from a hopper and automatically centered in position for the drill. When the hole is bored about one-third of the depth, the drill is withdrawn and the bolt is carried forward in the turret mechanism which holds it to a second and a third drill, completing the hole. Each drill is 0.01 in. smaller than the preceding one, providing for a minimum of friction and a maximum of clearance for chips. The holes are of uniform depth and in the center of the bolt. The average breakage is about three or four drills to the boiler.

Comparison of Costs.

Drilling in the boiler, per hundred (to which should be added the cost of replacement)	$0.90
Drilling under drill press, per hundred (to which should be added cost of drills and waste of material and labor	.45
Drilling in the automatic machine, per hundred (with the minimum number of broken drills and bolts destroyed)	.12

METHODS OF FINISHING STRAIGHT AND TAPERED BOLTS.

The usual method of finishing straight and tapered bolts for locomotives was to drill for centers, place in engine lathes, face under the head, turn the body taper, turn the part to be threaded straight and to proper size, face down the thread end to length and shape, leaving the center intact, test and file to accuracy, and cut off center point, after which the bolt was ready to be threaded in the bolt cutter and to have the hexagon head changed to any special shape desired.

About 1889, S. M. Vauclain designed and used a turning head in connection with a vertical machine for bolts up to 12 in. long. Under rights obtained from him the Pennsylvania Railroad placed an equipment of this kind in its Altoona shops and that was the only railway known to the author using other than engine lathe methods in finishing bolts.

As a great many straight and tapered bolts used in locomotives are 12 in. to 20 in. in length and even longer, it became necessary to design for this work a turning head which would handle taper bolts up to 18 or 20 in. in length and up to 1¾ in. diameter of thread, and straight bolts in any length up to 27 in. and up to 2½ in. diameter. It may be quite possible to go beyond these dimensions should the specifications require. These requirements have been met by a special machine of the vertical, multiple-spindle drill type, with which is used a special cutter head shown in Fig. 4. This head is the real or essential means of producing these bolts, either straight or taper and cylindrically true to the axis, the machine being simply a proper means of driving and feeding the bolt during the turning operation.

The cutter head consists of a retaining shell of cast iron, the bore of which must be round and straight; six segments, three of which are rigidly fastened to the shell, the other three having a limited amount of freedom and being fastened

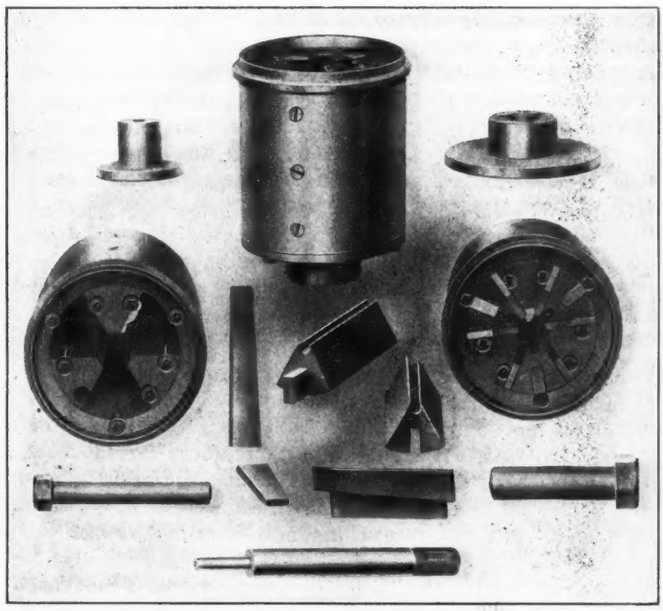


Fig. 4—Cutter Head and Attachments.

in place by a taper key with an adjusting screw located in the center of the radius with a bearing on the shell; and three blades, alternating with three guides, placed between the segments and backed up with taper keys and adjusting screws. The taper keys in connection with a certain amount

of taper on the blades and guides, have sufficient movement to provide for about one-eighth inch adjustment for re-grinding of the blades, or with the same amount on the guides, one-quarter inch in diameter of bolts. It will readily be seen that when an accurately ground plug gage of the size that it is desired to turn the bolt is placed centrally in the head, the blades and guides can be adjusted to their proper position. The three loose segments are then forced forward by the taper key, clamping the blades and guides rigidly in their proper working position.

The economical use of this method of turning bolts, particularly in the railway shops and locomotive works where taper bolts are largely used, necessitates a change of system. The usual practice, especially on repair work, has been to carry in stock only standard sizes of forgings, though in some cases the more common sizes were placed in stock finished. With the engine lathe located near the locomotive being repaired, the bolts were fitted to the hole after the least possible amount of reaming had been done that would clean up the hole. The improved system contemplates the turning, facing under the head, and placing in stock of standard sizes in lengths of 6, 9, 12, 15 and 18 in., varying in diameter under the head by thirty-seconds of an inch. Stock may be kept in sixty-fourths of an inch if desired, but very few holes will be found which require less than thirty-seconds of an inch to clean up. In fact, the chief reason for carrying the intermediate sizes would be to save the hole when it cannot be cleaned up within the next thirty-second. Standard reamers are used, with collars or marks to indicate when they have been driven to the required depth. All bolts have standard hexagon heads conforming to the thread diameter.

Bolts are specified with relation to the length and the diameter under the head, and the stock size next longest is used. Under these conditions not more than 3 in. must be cut off to bring the bolt to the proper length. The stock bolts are then taken to the bolt-altering machine, which is a quick-acting hand machine equipped with collet chucks and split bushings for the various diameters of the bolts. The end may be cut off to the proper length and turned for cotter pins, and the head changed to countersink, box head, button head, or whatever may be required. After threading on the bolt cutter, the bolt is ready to drive in place without further fitting.

A comparison of costs by the two methods, taking a 1⅛-in. × 9-in. bolt as an average would be about as follows:

Engine Lathe Practice.	Cost per hundred.
Drilling for centers	$0.22
Turning in lathe	2.50
Altering in lathe	$2.50 to 3.50
Threading in bolt cutter	.22
Cutting off center points	.10
Present Practice.	
Pointing the blank	$0.12
Turning by the method described	.45
Cutting off and changing points and heads where necessary on the bolt-altering machine	$0.40 to .60
Threading in the bolt cutter	.22

A device is now being perfected by which the threading can be done automatically at the same time the turning is done. This not only eliminates the bolt cutter charge of $0.22 per hundred, but assures a full, uniform thread absolutely in line with the body of the bolt and square with the facing under the head. When used in connection with a nut faced square with its thread the most satisfactory bolt is obtained.

A combined turning and threading device implies a modified form of the cutter head previously described, underneath which is attached a die head of special construction. This die head is carried on four or more vertical rods or guides which are attached to a ring to which the cutter is fastened. Provision is made for squaring the die head with the cutter head at the time it begins cutting the thread, and at the same time automatically placing the die head in a position where it is free to move in a vertical plane up or down in exact proportion to the difference between the feed and the pitch of the thread to be cut. An automatic knock-out is provided which opens the die head and passes to one side,

Table of Stock Sizes.

Showing Eight Threaded Diameters of Bolts and Thirty-Two Diameters Under the Head

Thread Diameter	¼				⅜				1				1¼			
Diameters under head	11/32	13/32	15/32	⅜	11/32	13/32	15/32	1	1 1/32	1 3/32	1 5/32	1⅜	1 1/32	1 3/32	1 5/32	1⅜
Length under head	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
					9	9	9	9	9	9	9	9	9	9	9	9
										12	12	12	12	12	12	12
													15	15	15	15
															18	18
Thread diameter	1½				1¾				1⅞				1¾			
Diameter under head	1 17/32	1 9/16	1 19/32	1⅝	1 13/16	1 7/8	1 15/16	1⅞	1 13/16	1 7/8	1 15/16	1⅞	1 13/16	1 7/8	1 15/16	1⅞
Length under head	6	6	6	6	6	6	6	6								
	9	9	9	9	9	9	9	9								
	12	12	12	12	12	12	12	12	12	12	12	12				
	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18

allowing the threaded bolt to go through to any length within the feed of the machine. Under these conditions it will be seen that so long as the length of the thread to be cut is the same, the length of bolt to be turned is immaterial. The device is very simple in its construction and does not call for a skilled mechanic to adjust or operate it.

A LOCOMOTIVE REBUILT IN 24 HOURS.*

On April 6 the Hornell shops of the Erie undertook to establish a record in repairing an H-21 consolidation locomotive, and the surprising result obtained affords a most striking object lesson of the value of thorough organization and harmonious united effort on the part of all concerned in the work. Engine 1734, of the Buffalo division, with a mileage of 47,485 placed to her credit since the last overhauling, which was at Hornell, Sept. 29, 1908, was put on the stripping pit and work began at 7 a.m.

H. T. Chamberlain, the general foreman, had previously talked the matter over with his foremen, each one being lined up as to his particular duties on the engine, and impressed with the importance of seeing that all work of even the minutest detail should be done not only promptly, but "well done," so that no criticism could fairly be raised after the engine was completed. The foremen of departments in turn had their men lined up as to what was to be required of them, so that almost before the sound of the 7 o'clock whistle had died away a large gang of men were busy attacking every part of the engine simultaneously, each one intent upon his own specific work. During the first hour there were over 60 men engaged at this work with the remarkable result that by 8.30 the engine was almost completely stripped and much of the work was well under way in the repair departments.

In undertaking work of this kind in an effort to make the very best time, naturally the longest and heaviest jobs were the ones which had to be gone after at the very start, and every moment of time utilized and every point made in order to advance that work. So it was that the front end, flues and driving wheels were assailed at the very first onslaught, and while these larger items were being "got after" other men were busy on the numerous details all over the engine.

The pedestal braces were marked and stamped with the figures for closing in the blacksmith shop before being removed. The first brace was delivered to the blacksmith shop at 7.30 a.m., the others following in quick succession. As quickly as they were received the blacksmiths proceeded to close them to fit the frames; the work was completed and de-

*From the Erie Railroad Employees Magazine for May, 1910.

livered back to the engine at 9 o'clock. The braces were then refitted to the frames and nine new bolts fitted by 11 a. m. The last pedestal was down and the engine raised and the wheels rolled from under at exactly 8.25 a. m.

The driving boxes were then marked and removed and the first driving wheels were placed in the lathe at 8.45 a. m., and the last tire turned and wheels delivered to the erecting shop at 3 p.m. In the meantime both main pins had been removed from the wheel centers and two new ones were fitted and pressed in and riveted over, also one new No. 2 crank pin removed and a new one fitted and applied. The right No. 1 and left No. 4 flanges were worn so thin that it was impossible to turn the tires again, so they were removed and two second-hand tires were applied and turned to size. One driving journal was returned. In addition to the new crank pins, three new crank pin collars were turned, polished and applied, 5 old collars trued up in the lathe and polished, and new nuts were turned and fitted to the new main pins. This was all completed and delivered to the erecting shop by 3 p.m., the work being thoroughly inspected and pronounced good. The engine frames were cleaned, white-leaded and tested for cracks by 9.30 a.m. The bolt gang removed 50 frame and pedestal bolts and new ones were fitted and applied, this work being completed by 5 p.m.

The driving boxes were removed from the journals immediately after the wheels were removed from the engine, the first one being delivered to the machine department at 8.30 a. m., and the last one at 8.50 a. m. Upon inspection it was found that 7 new crown brasses were required and also new brass hub liners on all the boxes. The new brasses were procured from the store department, turned, planed, pressed in, drilled and dowelled, old babbitt cut out from the side of the boxes and the boxes delivered at the fire to be poured with brass for lateral at 12 m. The heat was ready at 12.25 and the work of pouring was completed at 12.30 p.m All driving boxes were then replaned on the shoe and wedge faces, the first one being completed at 1.30 and the last one at 3 p. m.

Boxes were then rebored to fit the journal and faced for lateral, grooved and cellars refitted, and all but the main ones tinned on journal bearings, the first one being completed and delivered to the erecting shop at 2.30 p.m., and the last one at 5.30 p.m. On account of having to be spotted to the journal the main boxes were finished first, both of these being delivered at 2.30 p.m. They were immediately spotted and the grease cellars fitted and applied by 3.30 p. m. The last box was placed on the journals and completed at 5.40 p.m., and at that time the driving wheels were placed under the engine.

In the meantime the engine was squared, the jaws filed up and the pedestals refitted and box centers marked on frames, the old shoes and wedges were scraped and a complete new set was fitted up and applied; new wedge bolts and standard wedge bolt brackets were fitted to them. The first box size was obtained at 1.20 p.m., while the box was still on the planer. The men could wait no longer, and the first shoe and wedge was laid off and delivered to the machine to be planed at 2.30 p.m., this work all being completed and the full set delivered back to the engine at 5.30 p.m.

The wheeling operation was completed, wheels trammed and reported ready for main and side rods at 10 p.m. The first main rod was removed and delivered to the rod department for repairs at 7.30 and the last piece of the side rods at 8.40 a.m. The rod bolts and brasses were found upon inspection to be in very bad shape. It was necessary to ream the back end and main rods and straps and fit new bolts and also fit new bolts to the main connection spade straps, both sides, and to fit and apply new brasses and bushings all around. The work was all completed and the rods delivered back to the engine at 4 p.m., and at 12 o'clock, midnight, they were all applied ready for service and the last man in the fitting department was through with the engine.

While this work was pushed rapidly along, the same good progress was being made in other departments of the shop. For instance, the steam chests and valves were completely removed and all parts delivered for repairs by 7.30 a.m., and before 8 o'clock the valves were returned to the engine and at 8.10, one hour and ten minutes from commencing the work of stripping, the valve yokes also were received at the engine, having been inspected, examined for valve fit and the stems trued up. The valves and valve strips had been replaned and were ready for the re-spotting. Both valve seats on the cylinders were found to be in bad condition and they were refaced and the valves spotted. All steam chest studs were removed and annealed; complete new gaskets were applied to the steam chests and the pressure plates were re-lined and planed.

The valve rods were received back at the engine at 9 o'clock, having been fitted up with new bushings on the back end, one pin refitted and one new pin turned and fitted complete. The whole steam chest job, comprising valves, valve rods and glands, relief valves, steam chests, covers and casings, cylinder ports blown out with air and cleaned and port openings marked on valve stems, was completed in every detail by 4 o'clock in the afternoon, at which time the men engaged on that work went to work on another engine.

The air equipment and driver brake rigging were removed from the engine at the earliest possible moment. The air equipment, such as engineer's brake valve, double check valve, straight air valve, air pump, air gauge, triple valve, governors, straight air reducing valve and safety valve were delivered in haste, as though they were perishable goods, to the air brake department by 7.30 a.m., and all parts except the air pump were replaced on the engine by 1 p.m., having been thoroughly cleaned, overhauled and tested at the test rack. The driver brake rigging was also ably taken care of by the regularly assigned men who removed all parts in time to allow the wheels to come out before 8 a.m., the remainder being stripped by 9 o'clock. This work was given a complete overhauling, including reaming and rebushing of six of the hangers, removing old and fitting and applying new hanger posts or pins (one of which had to be drilled out of the bracket, it being impossible to remove it otherwise). New brake shoes were keyed on and fitted all around, and new brake pins were turned and applied complete and all lost motion was taken up in connections. New ends were welded on the brake beams and returned; the slack adjusting screws were removed, greased and reapplied and the brake cylinders tested.

The spring rigging was taken care of immediately after the drivers were removed, and at 8.30, just five minutes after the wheels were rolled from under, and before the engine was let down upon the blocks, all the rigging was removed with the exception of four equalizers, which, however, were removed half an hour later.

At 8.35 all spring hangers were delivered to the blacksmith shop for repairs, such as holes plugged and gib holes closed to fit the gibs. At 8.45 three spring saddles and eight driving box equalizers were delivered to the blacksmith to be welded out on box fit, the equalizers to have the holes plugged in addition. The blacksmiths turned out these jobs in an incredibly short space of time, and the pieces, one after the other, hot from the fire, were turned over to the machine side.

Here, not to be outdone by the blacksmiths, the machinist quickly completed his work and the parts were delivered back to the engine to be applied. The result was that the last piece of spring rigging was completed ready to apply by 2.30 p.m. By this time much of the rigging was already applied and immediately upon finishing the laying out of the shoes and wedges and getting them out of the way, the remaining pieces were put up so quickly that when the painter came around with his automatic spraying machine, just about 3 p.m., he found that all was O. K., on the left side and he "sprayed her black all over, inside and out." Just 40 minutes later, at 3.40 p.m., the other side was treated to a similar dose of "black fluid," and the engine was ready for her wheels.

The story of the applying of the wheels has already been told and we must now see what had been doing in other and equally important lines. Promptly at 7 a.m. the boiler inspector entered the firebox and at 7.15 reported seven broken staybolts located. By this time the gauges, injectors and other cab work were being removed, and the jacket and lagging were completely stripped from the firebox at 7.35 a.m. The seven staybolts were renewed complete by 9.15, and at 10.30 a.m., the jacket and lagging were replaced. Four new sections of jacket were made and fitted to both sides of the firebox, and the jacket on the boiler-head was repaired. Injectors were thoroughly overhauled; steam and air gauges overhauled and tested and pops and whistle removed, overhauled and reapplied; all of this work being completed by 1 p.m. All cab valves, main nigger-head valves, starting valves and dome blow-off valve were repaired, valves ground and stems repacked, boiler checks overhauled and ground and adjusted for lift, and whistle rigging overhauled and rebolted in cab. At 2.30 p.m., all of this work was reported finished and, upon inspection, was found to be O. K.

The engine bell and frame were removed from the boiler and the holes reamed in the frame and new pins turned and fitted complete; the bell was put in lather and polished and the bell ringer cleaned, overhauled and tested, new pins being applied. This work was all re-applied at 2 p.m. The cylinder heads, pistons and crossheads were removed complete at 8.40 a.m. The cylinders were examined at 8 a.m., and the right one reported to be bored, and the left one O.K. Upon inspection it was found that the guides did not need planing or grinding, and so the work of relining and rebolting them was begun at 9 o'clock and completed at 11.30 a.m., on both sides, six new bolts being fitted. Work was commenced at 8.45 on boring the cylinder and at 1.15 p.m., just four and one-half hours later, the machine was removed and the cylinder marked "O. K." The two new pistons were turned down to size, the left one being delivered to the engine at 9.35 a.m., and the right one at 1.30 p.m. Both sides were then closed up and the whole job was completed at 2.15 p.m., both piston glands having been overhauled and vibrating cups renewed and new gaskets applied.

The motion work and everything appertaining to it was stripped and overhauled complete, the first pieces, namely, eccentrics, hooks and straps, being delivered to the fitting department at 8.40 a.m., and the last piece, the rockers and lift shaft, at 9.45 a.m. All of this work was delivered back to the engine before 1.30 p.m. The transmission bars were returned to the engine at 11.15, rocker boxes at 11.40, links, lift shaft and reverse lever at 1.15 p.m.

The repairs on the motion work comprised the following items: Lift shaft bearings turned up and boxes counterbored, babbitted and rebored; new bushing fitted in the arm for the reach rod pin; reverse lever and quadrant overhauled, all holes reamed and new pins applied; also new latch spring, new pin in foot of lever, new pins in both ends of reach rod and new bushings for it; links closed and blocks refitted and riveted, saddles re-turned and three new link saddle bolts fitted and new bushings for all hook pins; transmission bars and hangers fitted with new bushings and pine re-turned; two new eccentric hook pins were made and the old ones refitted. Eccentrics were removed, new set screws and split keys applied, and keys fitted in eccentrics and axle. The eccentric straps were closed, rebored and reapplied; the rocker boxes were stripped and the left shaft was scraped. The boxes were rebabbitted and bored and a new shaft fitted and applied to the left one. All of this work was completed and reapplied by 4.30 p.m., and at 7.30 p.m., after the main wheels were squared and completed, the work of setting valves commenced, the men having been instructed to report for the purpose at 7 p.m. All the necessary adjustments were made and this operation was completed and the gang went home about midnight.

All the grates and grate rigging were removed complete before 8 a.m.; 16 new studs were applied and all grate connections were overhauled and new pins applied, the work being completed at 6.20 p.m.

The ashpan was removed complete and the sides repaired and reapplied, new studs being applied to the mud ring for this purpose. The hoppers were beyond repair and were cut up and new hoppers were applied in their place, this work being completed by 5 a.m., April 7. The work of painting the engine was followed up at intervals whenever opportunity afforded.

Work on the cab was begun promptly at 7 a.m. on May 6. The cab was washed inside and outside by 7.30, sand-papered and priming coat applied by 8, sand-papered and color applied from 10 to 11 a.m. Lettering was done from 12 to 1.30, noon, and between 3.30 and 4 p.m., the varnish was applied. The sash and doors were washed, sand-papered, two coats of ground color applied and graining and varnishing completed by 2 p.m. Standard green enamel was applied inside of the cab and the roof was painted. The jacket was cleaned, sand-papered and painted and the engine finished complete below the running boards as the opportunity came. Engine truck, drivers, pilot, smokebox, front end, and all pipes were carefully attended to.

Repairs to the tender progressed as rapidly as did the work on the engine. The cistern was raised from the frames and tested, all leaking rivets removed and interior braces reriveted, 250 rivets being applied. Tank valves were removed and replaced with the new ones, valve rods were removed and refitted complete, new brake staff flue applied, new shoveling sheet applied, manhole cover repaired with new hinges. The tender trucks were completely dismantled and 40 rivets were renewed in the frame and bolsters. New column bolts and box bolts were applied complete. The brake rigging was overhauled on the trucks and frames, including the hand brake. Four new brake beams were applied in accordance with standard practice, the old beams not coming up to specifications. A new coupler was applied. The top center plates and side bearings were rebolted complete and the safety appliance removed and made standard. The old drawbar was below standard and was replaced with a new one with new pins complete; new tank hose was also applied. Air pipes were examined and tested; also brake cylinders, air reservoir and triple valve. The cistern body was washed, scraped and sand-papered, and one coat of priming applied between 7 and 8 a.m. Sand-papered and first coat of color applied from 9 to 10. Second coat of color applied to cistern from 11 to noon. Lettering was done from 1 to 3 p.m, and varnish applied from 4 to 4.30 p.m. The trucks were cleaned and painted from 11.30 a.m., to 3 p.m., and the coal space and cistern top cleaned and painted between 7 and 11 a.m. Front end of cistern was painted from 3 to 4.30 p.m. With the exception of two men these departments closed down at 6 p.m, all the work except a few small jobs being completed. Repairs were made to cab doors, windows and floors, pilot and bumper beam. Repairs to steam chest casings, dome casing, testing of reservoirs, rebuilding of engine truck, overhauling of cylinder cocks and rigging and numerous other jobs cannot be spoken of in detail, for space forbids. All these items, however, were given close attention and the necessary repairs and alterations were made.

It was of the utmost importance that the flues should be gotten out with as little delay as possible, and to this end at 7 a.m., the netting and diaphragm boys crawled inside the smokebox and proceeded to strip them while a gang got busy on the front and door. Some difficulty was experienced in getting off many of the nuts, but difficulties only served to stir the men to greater activity, and exactly at 7.45 the boiler front and door were removed and laid aside, and at 7.46, one minute later, all the netting and diaphragm was out and the boys were busy in getting it in shape to be reapplied.

The front and netting being out of the way gave a chance

for the steam pipe gang to get busy. The dome cap, throttle rigging and stand pipe had already been removed and now the throttle valve, which had a very bad seat, was reground. At 8.24 sharp, out came the exhaust pipe and down went the plug over the cavity left open in its place. At 8.57 down and out came steam pipe No. 1, and at 9.03 out came steam pipe No. 2. Twenty minutes later the dry pipe was hustled out of its resting place and delivered at the "grinding mill."

This rapid work let in the flue-cutting gang at the front end, the back ends already being cut off, or nearly so, the work being completed only five minutes later. At 9.03 a.m., when the steam pipes were out of the way the boys applied the frame and motor for cutting flues, this operation taking just 10 minutes, and at 9.13 the first revolution of the cutter was made. At 11 a.m. the last of 370 flues was cut off. The remaining few flues had to be cut by hand. At 10.30, an hour before all the flues were cut, the gang started backing out and removing the flues, and at 1.30 p.m the last one was placed on the rack, and 15 minutes later they were delivered at the rattler.

At this time the boiler was scaled, and cleaned and washed. The dry pipe, tee head and stand pipe had already been ground. The dry pipe was put in, the flue sheet joint ground, the tee head applied, all broken steam pipe bolts and studs removed, the steam pipe rings ground and the exhaust seat spotted and the work completed by 5 p.m.

At 1 p.m. the flue gang commenced to apply coppers in the back sheet, this operation being completed by 4 p.m. The flues were poled off, cut to length, ends opened and filed and delivered in front of the engine ready to apply at 6.35 p.m.

Tubes were inserted in their proper place in the boiler, this operation taking 75 minutes, or in other words about 5 flues per minute or one every 12 seconds. They were quickly rolled and at 11.45 p.m. the flue men called for water for the boiler.

Men had reported for this work at 11 p.m., in anticipation, and in quick response had the water running in the boiler in less time than it takes to tell it. Four bursted flues were discovered with the hydrant pressure and at 12.35 a.m., when the hydrostatic pressure was applied, two others developed. The test was completed at 12.38 a.m.

The water was drained out and the bursted flues removed, flues prossered and beaded and finished at 3.30 a.m., April 7. Fifteen minutes earlier the steam pipe gang got in the front end and commenced applying exhaust and steam pipes, completing the job one hour and a half later, the men going home at 4.30 a.m., of the 7th. The netting and diaphragm were then applied, this work being completed at 5.58 a.m., of the 7th. While the boys were inside applying the netting, the front end men were also busy putting up the front and door, this job being commenced at 4.30 and completed at 5.30, with headlight, marker brackets and all work complete.

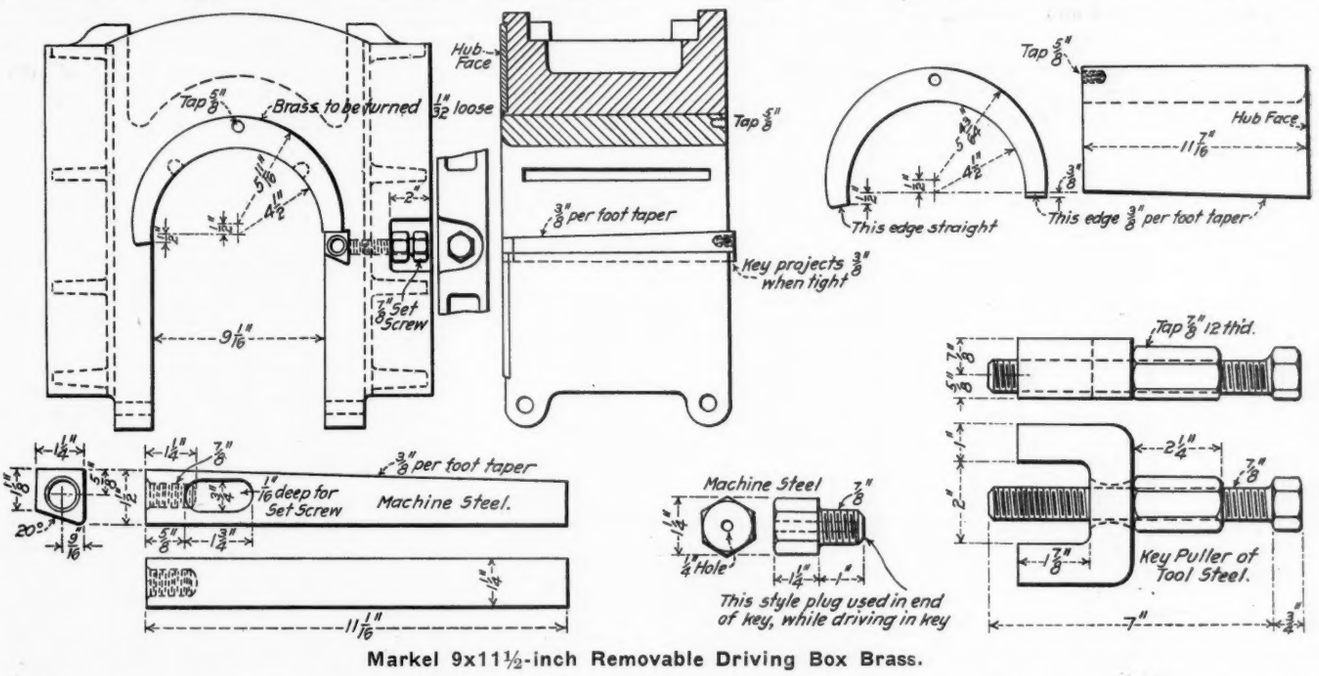
The crew of the engine was called for 5.30 a.m., and the engine ordered for a 7 o'clock train. At 5 a.m. of the 7th the engine was pulled outside and the tank coupled, the regular tank man being called for that purpose. A fire was started in the firebox at exactly 6 a.m., and in 40 minutes we had 150 pounds of steam. Before 7 o'clock the required pressure was obtained, the pops were set, air again tested, the air pipes, reservoirs and engineer's valve having already been tested from the shop line, the brakes were adjusted and certificates posted in cab. As the whistle sounded the 7 o'clock call to work, Engine 1734 passed over the turntable out to her train, which left at 7.33 a.m., from the yards.

The Hornell Shops established the remarkable record of 24 hours and 33 minutes from commencement of work back to revenue service, eclipsing all other records.

The trip up the division was made most successfully, and after returning to Hornell, Engineer Peck advised he had nothing to report, the engine being in fine shape. At 6 o'clock on the evening of the 7th she left Hornell yards with a full tonnage train, making the run to Buffalo in good time, and has since then been in daily service, pulling fast freight over the division.

REMOVABLE DRIVING BOX BEARING.

A description of the removable driving box bearing here illustrated was published by the *Railway Age* three years ago when it was first introduced. It is now possible to give results obtained in several years' service and figures showing the cost of renewing driving box bearings by this method as compared with the ordinary one, where the box and drivers are removed and the brass pressed in. It also forms a part of a change in the methods of making locomotive repairs employed by a western line where the expense of taking down the drivers is avoided. The device and the fixtures for finishing the box and bearing were designed and patented by Charles Market, shop foreman, Chicago & North Western, Clinton, Ia.



Markel 9x11½-inch Removable Driving Box Brass.

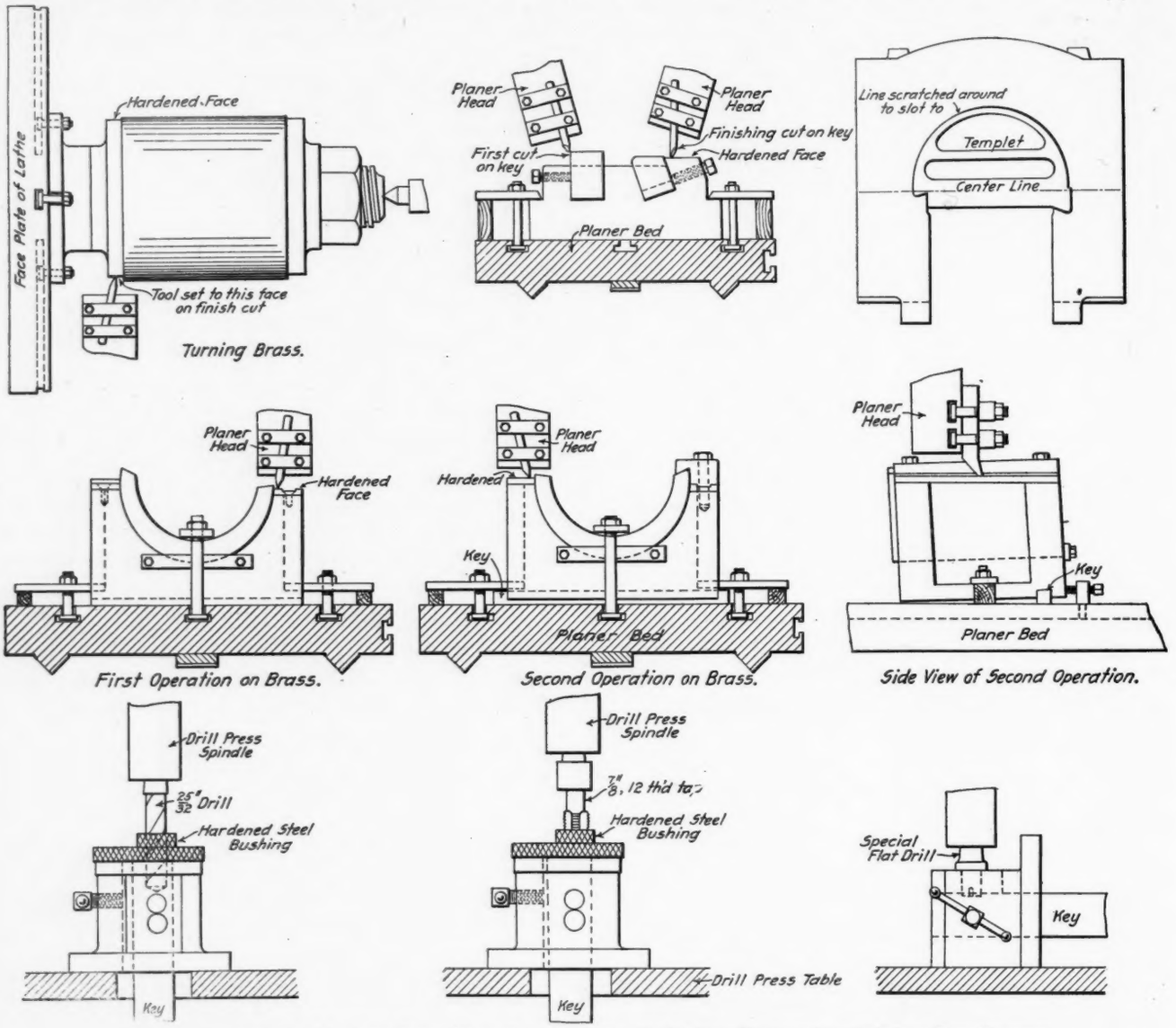
The box is slotted in the usual way, but the brass is turned 1/32 of an inch smaller in diameter than the box fit. The brass is also planed tapered on one side, 3/8 in. to the foot, to corre-

spond with the taper of the wedge. The wedge fits into the dovetailed portion of the box and the upper side is tapered so as to be parallel with the tapered portion of the brass. The brass is held in position entirely by the wedge, which is driven in so as to require 40 tons hydraulic pressure to start the brass. There is a hole in the end of the brass for removing it by hand; also a tapped hole in the end of the wedge to receive the device for pulling it.

The advantages of the device are that the wedge secures a perfect fit of the brass in the box and any tendency to become loose is corrected by an adjustment of the tapered wedge. It is possible to remove a driving box brass and put in a new one and have the engine ready for service without dropping the axle or dismantling the engine in any way. This work can be done in four hours and thus prevent the much longer delay required when the wheels are entirely removed for renewing the brass.

The other important advantage is that the driving box bearings can always be kept tight, while under ordinary practice they are allowed to run loose for some time before repairs are made, and in the meantime they contribute largely to broken frames, crossheads, eccentrics, straps and pins. With the Markel device the bearings may be worn down to any thinness desired—even to ½ in. thick. Under this system it is desirable to make the box, brass and wedges in duplicate and interchangeable, so that they can be fitted up and kept in stock. For this purpose Mr. Markel has designed jigs that make the bearings and key exactly alike without measurements, and the work is done quickly. One of these jigs for finishing the tapered key is shown in the drawing. The key is made from cold rolled machine steel and is planed on the top and bottom sides; when it is first placed in the jig a ⅛-in. cut is taken. The planed surface is then placed face downward in the jig and the planer tool is brought to a hardened face, which sets it for the proper thickness, and one cut is taken across the key. It is thus cut to the proper size and taper, and no calibrating or measurements are required.

One of the drawings shows the removable driving box brass and details as applied to a 9½ x 12-in. axle. The original trial brass was applied on April 9, 1906, to a right front box on an Atlantic type engine with a 9 in. x 12 in. journal and



The Jigs and the Various Operations Required for Finishing Removable Driving Box Brasses.

20 in. x 26 in. cylinders. This engine is in heavy fast passenger service on a 202-mile division. The brass is still in service, has never been loose, and up to February 1, 1910, had made 261,049 miles at no labor or material cost since its application. The other three pressed-in brasses on this engine have been renewed twice during this time, because they were loose in the boxes and large on the journals. The Chicago & North Western has had 10 heavy freight and passenger engines equipped complete with these brasses since 1906, and has renewed them at different times without dismantling any part of the engines except taking down the cellar, or the two eccentrics, if on a main box.

Following is the record of the removable brasses on Atlantic-

type engine No. 464 since their application on July 4, 1906. On February 26, 1907, the left main brass was renewed while the wheels were under the engine at a cost of $3.20 for labor and six hours' loss of time to the engine. On the basis of $10 a day for a locomotive, the saving made was $29.25 in favor of removable brasses. In June, 1908, this brass was closed and rebored for the axle fit while the wheels were under the engine at a labor cost of $6.21, the work requiring six hours. This cost includes the lining down of one wedge; the total estimated saving caused by the use of the removable brass was $26.33. The mileage made with these brasses has been very good and they have proved the most economical brasses used on the Iowa division as to mileage, expense of labor and loss of time to the engine.

The figures below show the saving effected by the use of the removable brass as compared with the pressed-in brass. The removable brass was renewed February 26, 1907. It being a main brass, the two eccentrics had to be removed from the axle. The cost was as follows:

New brass (cost of material)	$21.49
To bore to axle fit	.19
For labor to apply to box	3.20
Loss of time to engine, 6 hrs.	2.46
Total cost	$27.34

To apply standard brasses the engine would have to be dismantled and the main wheels dropped, causing an expense of:

New brass (cost of material)	$21.49
Labor for all work	15.00
Loss of time to engine, two days	20.00
Total cost	$56.49

This shows a saving of $29.25 for the removable brass. The removable brass was removed, closed and rebored for axle fit, June 29, 1908. It being a main brass, the two eccentrics had to be removed from the axle. The cost was as follows:

Sheet iron shim	$0.10
Labor on shim	.05
Labor to apply brass & complete ready for service	6.21
Loss on time to engine six hours	2.46
Total cost	$8.82

If this had been a standard pressed-in brass the engine would have had to be dismantled and the wheels dropped. The cost would have been:

Sheet iron shim	$0.10
Labor	.05
Labor to supply and equip engine for service	15.00
Loss of time to engine two days	20.00
Total cost	$35.15

This is $20.33 more than for the removable brass.

If the removable brass becomes loose in the box the cost of repairs is as shown below. If front or back brass is loose it can be tightened in one hour; if a main brass, in four hours:

Average labor cost	$0.92
Loss of time to engine	1.68
Total cost	$2.60

The standard pressed-in brass, if it becomes loose in the box, costs as follows to make repairs, including dismantling, dropping wheels, tightening brass in the box and assembling all parts ready for service:

Labor	$15.00
Material	.10
Loss of time to engine two days	20.00
Total cost	$35.10

Costs, $32.50 more than removable brass.

The cost is thus $32.50 more than for the removable brass.

During the calendar year 1909, 349 miles of railway were opened for traffic in all Brazil. Of this total, 100 miles were on the various lines of the Brazil Railway Company between Sao Paulo and Rio Grande do Sul. On the Northwestern of Brazil Railway, in process of construction from the state of Sao Paulo to the Bolivian border, some 25 miles were opened for traffic, and about 42 miles of line were opened on the Victoria-Diamantina Railroad, in Espiritu Santo and Minas Geraes. The remaining extensions were on the various lines under the control of the federal government.

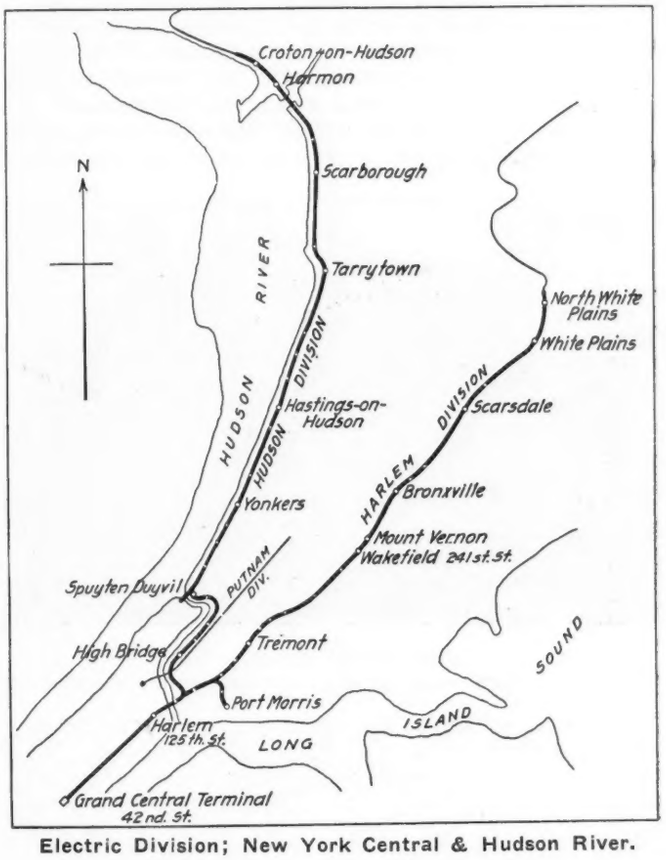
CARE AND HANDLING OF ELECTRICAL EQUIPMENT, NEW YORK CENTRAL & HUDSON RIVER.

BY F. E. LISTER,
Associate Editor of the *Railway Age Gazette.*

The care and handling of the electrical equipment of the New York Central & Hudson River has developed an organization which differs in many ways from that required for steam equipment. While this organization and its working may not be directly applicable to steam railways, it illustrates a number of methods which could be applied, in part at least, to advantage in handling steam railway equipment.

MILEAGE AND TRAIN SERVICE.

The electric division of the New York Central covers a total of 58 miles. It has two branches: that part of the Harlem division running from the Grand Central station, New York City, to North White Plains, 24 miles, with a 1.8-mile branch from Melrose to Port Morris, and that part



Electric Division; New York Central & Hudson River.

of the Hudson division, from Grand Central station to Croton-on-Hudson, 34 miles. The electrical operation of the Harlem division is completed to North White Plains, while on the Hudson division, the third rail at present extends only to Yonkers, 15 miles from the Grand Central station. The two divisions use the same track as far as Mott Haven Junction, 138th street, just across the Harlem river, where the Hudson division turns west to the Hudson river, which it follows north to Albany and Troy, while the Harlem division goes northeasterly to Chatham.

There are 61 trains per day over the Hudson division, 44 of which handle suburban business. All through trains on this division are handled between the Grand Central station and High Bridge, eight miles, by electric locomotives, while the multiple-unit trains, which take care of the bulk of the suburban business, operate between the Grand Central station and Yonkers. When electrification of this division is complete the multiple-unit trains will run to Croton-on-Hudson and the through trains will be handled to and from this point by electric locomotives. The present steam locomotive ter-

minal at High Bridge will be replaced by a new 30-stall roundhouse at Harmon, one mile south of Croton.

There are 48 trains per day over the Harlem division, all of which handle suburban business. The multiple-unit trains operate to North White Plains, while those trains that are destined for points beyond this, as well as those coming from the north, are handled by electric locomotives between North White Plains and the Grand Central station.

EQUIPMENT.

The electrical equipment necessary to meet the requirements of this service consists of 45 locomotives, 137 steel motor and 49 steel trailer cars. The motor and trailer cars are used only in the multiple-unit train service.

The locomotive, of which illustrations and descriptions have been published in the *Railway Age Gazette* on several occasions, weighs about 200,000 lbs., has a driving wheel base of 13 ft. and a total wheel base of 36 ft. It is equipped with four 600-volt d.c. motors of 550 h.p. each, giving a normal rating of 2,200 h.p. and a maximum of 2,800 h.p. The Sprague General Electric multiple-unit control is used, there being two master controllers, one in each end of the main cab, for operating in either direction. The control system carries a minimum of 300 and a maximum of 750 volts.

The steel motor car weighs 106,000 lbs., is 60 ft. long and has two motors. The multiple-unit trains are usually made

High Bridge Force.

For light and general inspection and repairs to electric locomotives.

up of two motor cars to one trailer car, six cars per train, and all operated from the controller of the leading car.

The inspection and repair of locomotives and cars is at present handled at four points: Lexington avenue (Grand Central station), High Bridge, North White Plains and Harmon. General terminal inspection and light imperative repairs are handled at Lexington avenue; light and general inspection and light repairs of locomotives at High Bridge; general inspection and light repairs to cars and light inspection of locomotives at North White Plains; all general heavy repairs are handled at Harmon.

The above outline covers the existing condition, which is in part temporary, pending the completion of the third-rail extension from Yonkers to Croton-on-Hudson. When this is completed, probably within another year, the locomotive work, which is now handled at High Bridge, and the general inspection of cars, now done at North White Plains, will be taken to Harmon. The present Harmon shops were built with this end in view. The 30-stall roundhouse to be built at Harmon will provide a terminal for the steam locomotives which are now cared for at High Bridge, between which point and Grand Central station the through trains are handled by electric locomotives. When the proposed electrification is completed, steam passenger locomotives will not approach nearer than 34 miles to New York City on the Hudson division and 24 miles on the Harlem division. All inspection and repairs to both locomotives and cars, save the light terminal inspection at Lexington avenue, will be handled at the general shop at Harmon.

In following the details one important idea must be kept constantly in mind. When electrical operation was inaugurated on the New York Central, about five years ago, an entirely new organization was formed for prosecuting a work for which no previous experience was available from which to formulate the handling of details. The electric locomotive was a very recent development, knowledge of the operation of which was confined almost entirely to test results, without any data as to its performance in actual and continued service. This same condition, to some extent, was true of the multiple-unit train equipment. It was plainly necessary to institute experimental work, and on a large scale, at the outset. The result has been an organization having a very systematic check on details. A number of reports, reproduced herewith, show the extent to which detail work is necessary to maintain a check on defects in equipment with the idea of discovering the weak points.

FORM E. E. 31. C.R.I.S. 9-16-10-1M.

March 14 1910

Supt. Electric Equipment.

Dear Sir:—

I beg to report the following {Defect / ~~Detention~~} occurred on March 13 19 10

Northbound X Southbound ____ Harlem Div. ____ Hudson Div. X

Train No. Poled from Lex. Time 1:30 A. M Place ____

Detention in mins. ____

Elec. Engine 3227
Cars in train ____

Motorman ____ Operating Inspector ____

Condition of equipment reported by Edwards

Defect / ~~Detention~~ } was Ground #1 Armature

Repairs made en route ____

Condition found when inspected by me at High Bridge

Date March 13 Time ____ M., was as follows:

Found #1 Armature had been flashed over from commutator to spokes of wheel. This carbonizing canvass head to end casing of commutator which was grounded.

My opinion as to cause is as follows:

This could have been caused by reversing engine and giving it too much current and also could be caused by brake shoe dust accumulating on canvass head allowing current to carry across.

Present condition of equipment (if any repairs made, state repairs in detail, giving location, time and date)

Cleaned up armature and canvass head, tested same and found O. K. in service.

NAME J. Van der Bogart

POSITION Foreman

NOTE—If brake trouble, give piston travel, and state condition of brake valves.

Armature Defect Report.

The successful operation of this system depends largely on systematic inspection, which must be constant and rigid. All general inspection is based on a mileage of 1,200 miles for both locomotives and cars, although either may be inspected before making this mileage in case of reaching the shop for repairs.

HIGH BRIDGE LOCOMOTIVE INSPECTION.

As previously stated, light and general inspection and light repairs of electric locomotives are handled at High Bridge.

E. E. 21. C.H.S. 6-10-09-600.

New York Central & Hudson River R. R. Co.

ELECTRICAL DEPARTMENT.

March 16, 1910.

Supt. Electric Equipment.

Dear Sir:

REPORT OF CONTACT SHOES BROKEN.

Equipment No. 3208 Date March 14, 1910.

Number of Shoes 1 Train No. Poling South

Location of damage No. 2 End, B. side

Cause

Struck some thing at 54th Street.

Reported by Engineer Hoyt.

(Signed) J. Vander Bogart.

Upon the arrival of any car or Locomotive at your station with Contact Shoes missing, telephone the information at once, fill out this report and forward as above.

Broken Contact Shoe Report.

E. E. 20. C.H.S. 1-1640-1M.

New York Central & Hudson River R. R. Co.

ELECTRICAL DEPARTMENT.

Date March 31 1910

Supt. Electric Equipment.

Dear Sir:

The following changes were made on Electric Locomotives Pony Truck Boxes

NUMBER	CHANGED		DATE CHANGED
	No. 1 End	No. 2 End	
3229	2	2	
One Box on	No. 2 End	Trailer Wheel	
One Box on	No. 2 End	Leading Wheel	
Two Boxes	on No. 1 End	Leading Wheel	

Changed No. 1 End 2

Changed No. 2 End 2

Completed - - -

Still due - - -

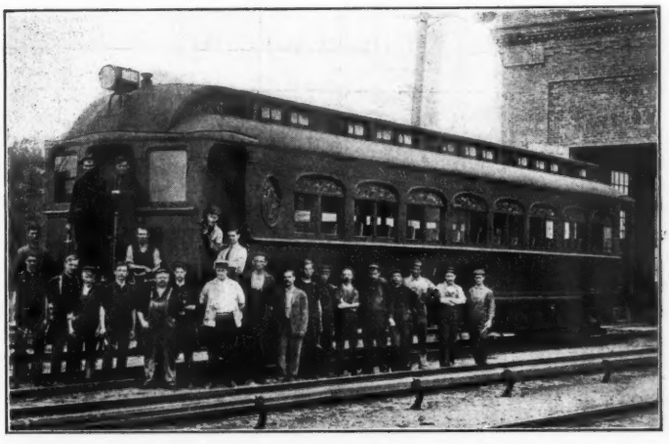
J. Van der Bogart Foreman.

Report of Electric Locomotive Changes.

Light inspection is made between trips while general inspection is made on the mileage basis of 1,200 miles. The day force is shown in the illustration; the night force has but three men. The inspection shed, a frame structure, has two longitudinal tracks, one of which is served by a drop pit. This shed will accommodate four locomotives at a time, two on each track. As a locomotive inspection necessitates holding it out of service but a few hours, this shed provision meets the requirements, especially since a locomotive may be partly inspected outside the building.

On arrival at the general inspection shed, the locomotive is first gone over by the general inspector, whose duty it is to locate all of the heavy work required, so that it may be placed in the shop accordingly. When in the shop, the first work is to blow the dust from the armatures, field coils, brush holders, running gear, etc., using a jet of air at about 115 lbs. pressure. The general inspection and repair work then follows, each of the several inspectors being responsible for a certain part of the work on all locomotives.

One man, for instance, goes over the journal boxes, removing all of the waste and refilling the boxes with either new waste or with the old waste loosened up and re-oiled. There are two inspectors who work in the secondary cabs, one in each. Their work includes the filing or replacing of contactor tips. The tips are made of hard copper, but, due to



North White Plains Force.

For light and general inspection and light repairs to cars and light inspection of locomotives.

arcing, they become burned so badly that proper contact is impossible. In the majority of cases, filing will correct them, but new ones are often necessary. The secondary cab work also includes inspection of the rheostats, covering the tightening of the grid bolts and replacing of new for broken grids. After completing this work, the dust and filings are blown down with an air jet. An air equipment inspector goes over the compressor, air gage, brake cylinder, brake valve, feed valve, signal reducing valve, distributing valve and overhead trolley valve. A record of the periodical inspection and repairs of the air brake equipment is stenciled in the cab. The light inspection includes only the more important parts and the foundation brake rigging for piston travel and general defects. The general wiring and the controllers and switches are gone over, the motors and trucks are cleaned, the motor and truck bearings oiled, the contact shoes and beams inspected; in fact, every part of the locomotive is examined where a defect might cause trouble on the road. In itself, the inspection is what would naturally be expected, but the interesting feature, and the one which so decidedly differs from that of a steam locomotive, is that the details to be watched are much more numerous. A general inspection of an electric locomotive might be likened to the running repair work on a steam locomotive. On the steam locomotive the repairs are confined almost entirely to those reported by the engineman, such as closing rod-brasses, packing pistons

and valves stems, lining down wedges, packing all boxes, washing the boiler, cleaning injectors and engineer's valve, etc. On an electric locomotive all parts are inspected and repaired, whether reported or not.

An inspection record card is kept for each locomotive, and as the work of each kind is completed the inspector records the fact by signing for the work which he has done. This record serves two purposes: the foreman can know just how far the work on any locomotive has progressed, and in case of a faulty inspection causing subsequent trouble he knows where to place the blame.

After the inspection is completed, the foreman's office reports that the locomotive is "O. K. for service." The despatcher's office then sends a crew for the locomotive and it is placed on the O. K. track to await orders. This O. K. track adjoins the main line and over a portion of it is an inspection shed for handling light work between trips, such as replacing brake or contact shoes.

The final duty of the foreman's office each day is to make a record of the locomotives which have been or are in the shop on that day. A copy of one of these daily locomotive reports is as follows:

Daily Report.

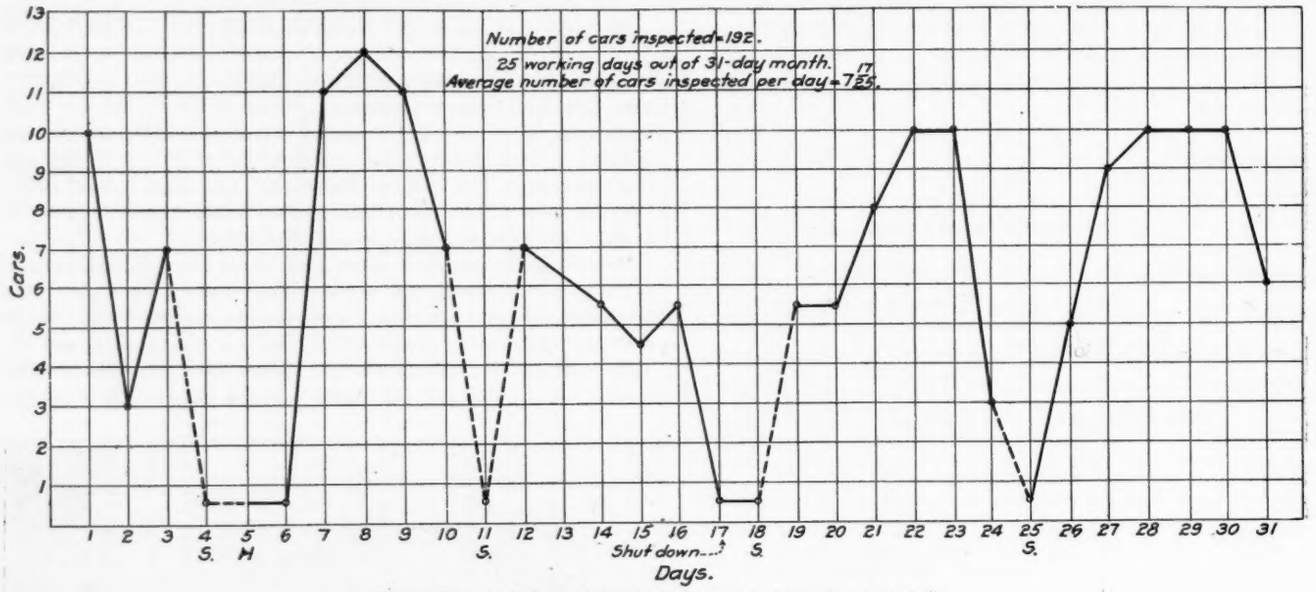
April 7, 1910.

3235. Inspected, O.K., in service.
3232. Inspected, O.K. in service.
3201. Reverser trouble repaired, O.K. at inspection shed.
3219. Inspected, O.K. at inspection shed.
3228. Broken tire, changing armature.
3229. Under inspection. No broken shoes.

J. VAN der BOGART, Foreman.

When the night despatcher phones to the O. K. shed for information regarding inspected locomotives ready for service, the information is given him from this report.

Reproductions of the printed report forms, which are given herewith, and also copies of the "Day" and the "Night" report pages of the book in which all the O. K. track inspection is kept, are particularly interesting, in that they show a system which differs very decidedly from steam locomotive practice. For instance, "cotter key in brake hanger pin" and "adjusted signal whistle" are defects which would be repaired without comment in an ordinary roundhouse, but not so in connection with the electric locomotive. This record book, copies of two reports of which are given herewith, is kept at the O. K. inspection shed for two weeks, when it is sent to the office of the superintendent of electrical equipment and replaced at the inspection shed by a similar book just returned from the office. From these daily reports the superintendent of electrical equipment is in a position to know just what parts of the equipment require the most inspection or renewal, where designs are faulty, etc.



Cars Inspected at North White Plains, July, 1909.

O.K. Inspection Shed Report.

DAY.

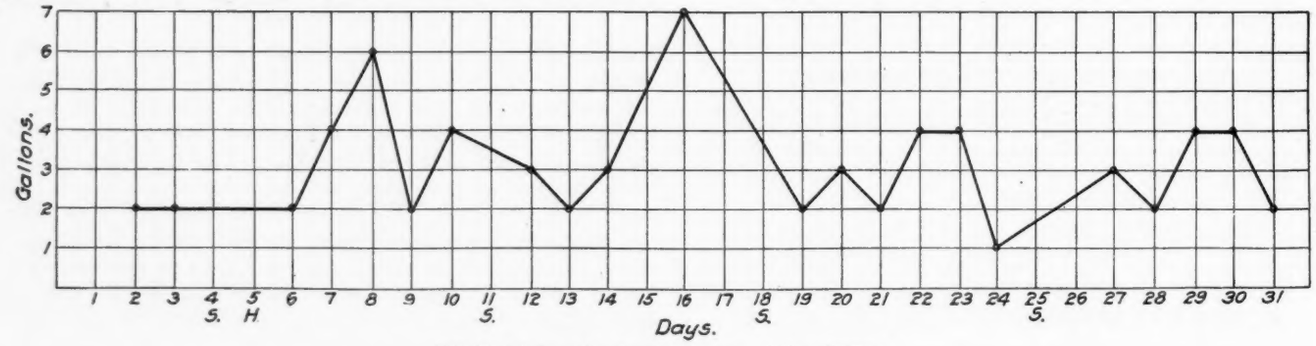
Thursday, April 7, 1910.

3209. Reported hot box, No. 2 end, B. side and trailer wheel.
3242. Reported for brake-shoes. Placed two second-hand shoes, No. 3 driver, A. side and No. 1 driver, B. side. Adjusted piston travel.
3222. Gasket in train line air hose, No. 2 end. Two broken thrust bolts, No. 2 driver. Drilled out holes and replaced thrust bolts.
3224. Came up on train No. 51. Broken contact shoe caused by broken spring. Made up new shoe.
3235. Cotter key in brake hanger pin, No. 3 driver, A. side.
3244. Cotter key in brake hanger pin, No. 1 driver, A. side.
3239. Open circuit on headlight, No. 1 end. Repaired same.
3230. Reported for reverser trouble.
3218. Repair cab light, one 10-c.p., 140-volt lamp.
3212. Repair cab light, one 10-c.p., 140-volt lamp.
3221. One oil cup for marker, one 1,000-amp. fuse in tool box.
3230. One wick for marker, one red disc.
3242. One red disc.

O.K. Inspections:

3235	3242	3239	3228	3218
44	12	21	30	09
22	08	24	14	23

Filed all contactors; bled reservoirs; signal whistles, overhead trolleys and piston travels tested. Brake arms, bells, knuckles and pony wheels oiled.



Oil Used in Air Compressors, July, 1909.

NIGHT.

Thursday, April 7, 1910.

3230. New light of glass, 15 in. x 25½ in., No. 2 end, A. side, main cab.
3246. Cut out and spotted to go down on No. 90. One 1,200-amp. fuse put in tool box.
3232. Two 140-volt lamp in cab circuit.
3235. Sent 40-amp. pump switch to Ryan's car for No. 12. Van Atten on train No. 40.
3212. One 1,200-amp. fuse put in tool box.
3233. Repairs on broken window sash slide piece and new light of glass, No. 2 end, A. side.
3201. From repair shop and put in service.
3219. From repair shop and put in service.
3245. Sent to repair shop. (Orders from Ryan's car.)
3244. Sent to repair shop for inspection
3238. Sent to repair shop for inspection.
3221. Came up on No. 79. Broken contact shoe, No. 1 end, B. side. Caused by leading wheels running off track in yard while in switching service during the day. For detailed report see Ryan's car. Put on new contact shoe. Held engine at this shed. Pump running hot, also needs brake-shoe, No. 1 end, B. side.

O.K. Track Inspections:

3217	3242	3223	3208
22	46	07	19
12	09	14	21
32	30	18	30
		37	

3237. Sand trouble removed.
3208. Sand trouble removed.
3212. Adjusted signal whistle.
Reservoirs bled, contactors filed, signal whistles and knuckles O.K.

Several of the items reported above were for "fuses placed in tool box." Each locomotive tool box should contain three 3-amp., six 4-amp., four 10-amp., two 15-amp., three 25-amp., two 40-amp., four 1,000-amp. and four 1,200-amp. fuses, and it is the duty of the inspector to see that these fuses, 28 in all, are maintained in the tool box.

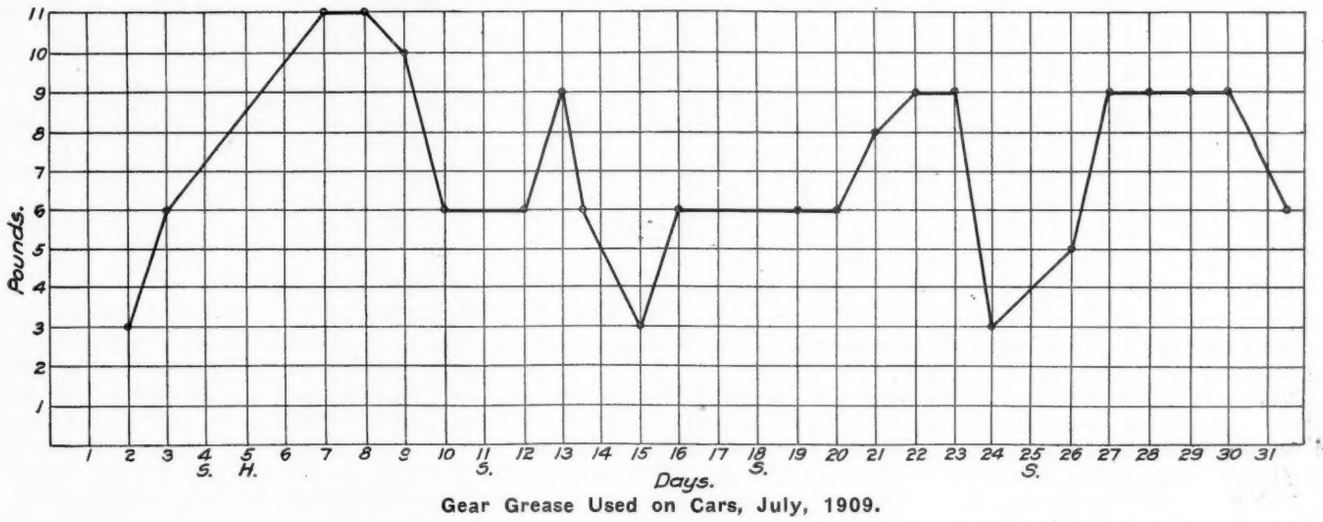
Reference to the reproduction of the "Report of Contact Shoes Broken" shows the check which is maintained on accidents. The information is telephoned to the office of the superintendent of electrical equipment and steps at once taken so that a similar accident will not happen to the next locomotive passing the same point.

The report on changes of pony truck boxes is one which is made out for purposes of record, and shows where changes are necessary, giving a line on the action of the trucks in service.

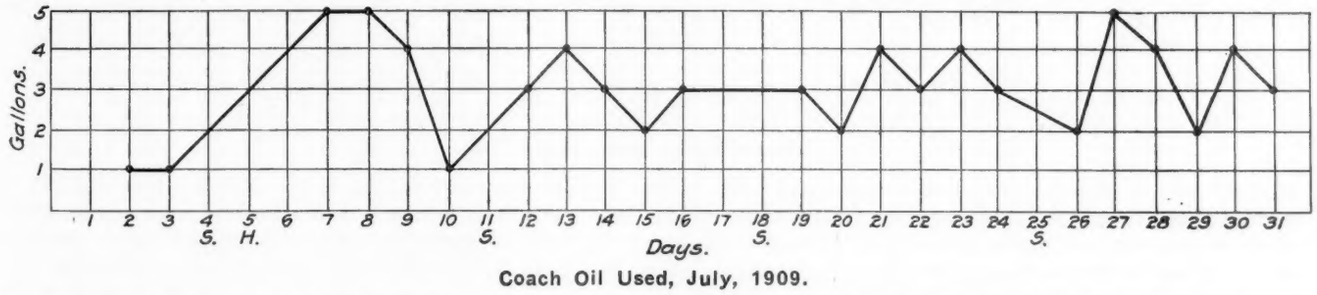
The defect report gives a complete history of a grounded armature and also the opinion of the foreman as to the cause of the defect. The value of this report lies in the superintendent of electrical equipment having available data on actual service troubles on which to base alterations in the designs of equipment and parts. This same form is used for detention reports, and a two-minute detention, caused by blowing out a defective train line gasket, is sufficient cause for making out a full report.

NORTH WHITE PLAINS CAR AND LOCOMOTIVE INSPECTION.

The work handled at North White Plains includes light and general inspection and light repairs to cars and light inspection of electric locomotives. The light inspection of motor cars is made between trips; the general inspection is made after 1,200 miles have been run, the same as for the locomotives. The mileage record form, reproduced herewith, shows the method employed for keeping account of each car's actual mileage and for transferring them from service to the inspection shed at North White Plains. The printed form contains the numbers of all the motor cars. The report is made out for every 24 hours, ending 11.59 p. m., and contains the mileage which each car has made since its last shopping. Each day's mileage is added to the record, and when a car has made more than 900 miles, an X is placed after the number. This indicates that it will soon be due for a general inspection. It is necessary to allow about 300 miles in this way, as a car will usually make this amount before it can be placed in a train due for the inspection shed. The yardmaster who makes up the trains at the Grand Central Station must use the cars during the day so that at night he will have two five-car trains for the inspection shed. These are used for late trains and are sent to the inspection shed on arrival at North White Plains. As they are taken out of service they are replaced by cars that have just been inspected. An average of 10 cars per day must be inspected in order to keep within the mileage limits. Each car makes, on an average, 100 miles per day, so that general inspection is due about every 12 days.



Gear Grease Used on Cars, July, 1909.



Coach Oil Used, July, 1909.

Reference to the mileage report of April 9 shows that 10 cars, those whose mileage figures have lines drawn through them, have just been received at the shed. It also shows that 16 cars, those opposite which no mileage is recorded, are out of service, either at the inspection shed at North White Plains or the shop at Harmon. The North White Plains facilities

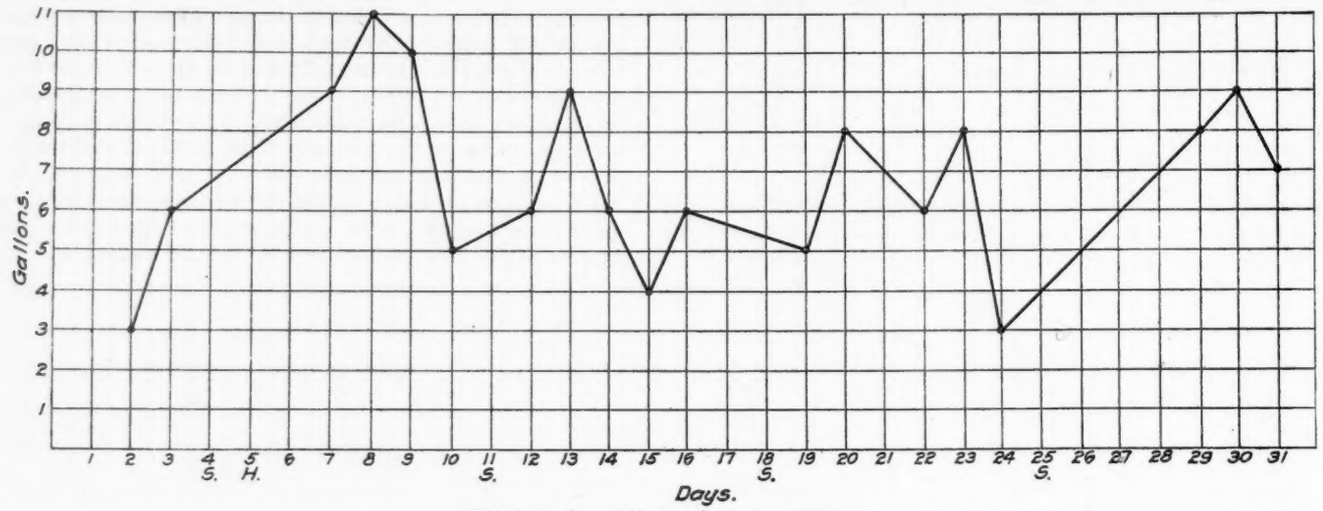
include a brick building, about 400 ft. x 40 ft., containing three longitudinal pits. Two of these are used for car work and the other for locomotive work.

General inspection of a motor car includes going over the air compressor, motors, trucks, car body, brakes, contactors, reverser, circuit breaker, controllers, switches, general wiring, motor and truck bearings, gear greasing, and contact shoes and beams, in fact, all general electrical and mechanical work which may be handled without other facilities than pit space.

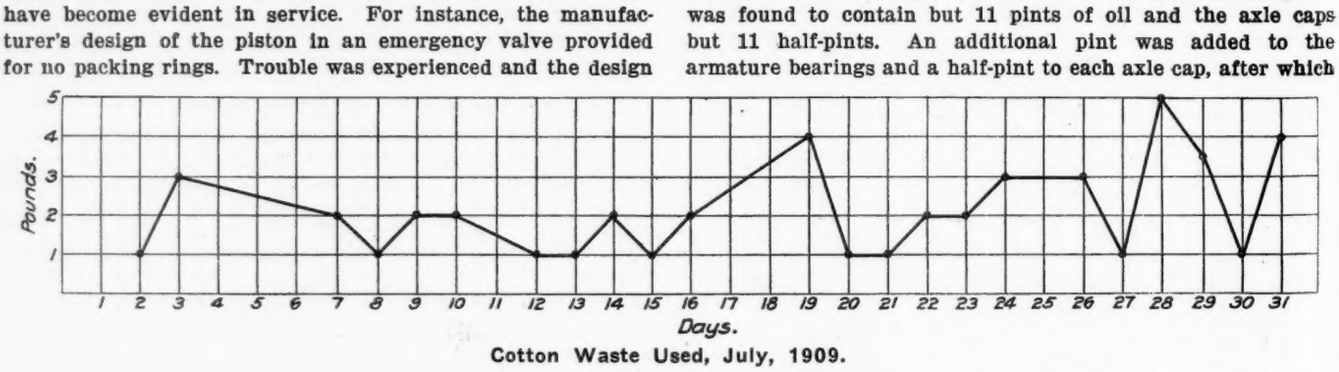
The running gear and electrical equipment are first cleaned with an air jet. Each inspector has his own portion of the work to perform on all cars, and, on completion of it, he indorses the car's repair card, as is the case with the locomotive inspection. This card is kept on file for record of work done and for future reference. Each inspector has two small record books. One of these is filed at the office while the other is in use. During the day he records the work which he handles, turning the book in at the end of the day and receiving the other one in exchange. The office makes a record in the shop book of all work done during the day. There are two of these shop books, one of which is kept in the office of the superintendent of electrical equipment for two weeks, when it is exchanged for the one at the shop.

In addition to the general work mentioned, considerable special work must be covered. This includes defects which have become evident in service. For instance, the manufacturer's design of the piston in an emergency valve provided for no packing rings. Trouble was experienced and the design was changed at the shop to include a packing ring. The trouble ceased and it was then decided to change the pistons of all valves. Special work also includes a number of parts of the equipment that are gone over only at stated intervals. For instance, compressors every twelve months; feed valves, four months; triple valves, three months; brake valves, three months; signal valves, six months; signal whistle valves, one year, and brake cylinder valves, one year. To have a check on this special work, separate records are kept of each kind of work, under headings as follows: Pistons with packing rings installed; compressors inspected; triple valves inspected, etc. At the beginning of the day's work, the office sends a list of special work to be done, and when it is reported back as completed, a record is made accordingly.

A number of diagrams given herewith are interesting as showing methods of keeping graphical records which show at a glance general shop conditions. These records are local with the North White Plains shop and are valuable only as an indication of the fluctuations in the work and the supplies used. The record of cars inspected during July, 1909, shows a total of 192 cars for the month. It will be noticed that no cars were allowed to remain in the shed over Sundays. The record of oil used in air compressors shows a total of 69 gals. In general, it corresponds with the number of cars inspected, but as it is a record of oil drawn from the storeroom on the several dates rather than that actually used on those days, it should not be expected to conform more closely. The results of service tests of oil consumption are interesting and establish valuable oil records. Car No. 3004 was placed in service on December 20, 1909, with the indicated amounts of oil and yarn in its armature bearings, journals and axle caps; it was inspected on January 10, after a mileage of 1,148 miles, and it was found that no additional oil or yarn was necessary. It was again inspected on January 18, after making 1,084 miles since January 10, and still no oil or yarn was necessary. On January 31, however, the armature bearing box was found to contain but 11 pints of oil and the axle caps but 11 half-pints. An additional pint was added to the armature bearings and a half-pint to each axle cap, after which the car was run until March 13, making a total of 3,281 miles on the supply which it had on going into service after its January 31 inspection. The total mileage made from December 20 to April 2 was 7,893 miles, the record showing that 14 pints of oil were used on each armature bearing, 12 half-pints on each journal box and 14 half-pints in each axle cap. The test of car No. 4054 does not show such good results. The total mileage in this case was 5,738 miles.



Electric Car Oil Used, July, 1909.



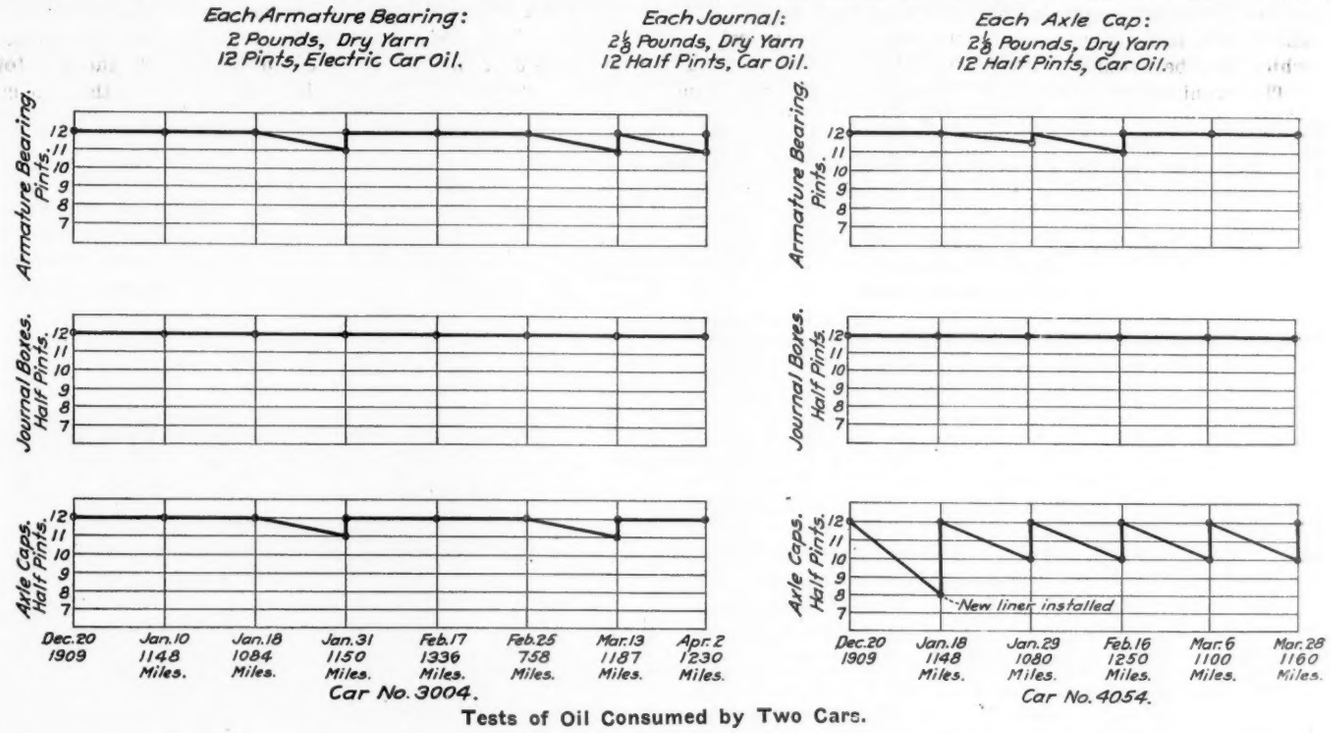
Cotton Waste Used, July, 1909.

HARMON REPAIR SHOP.

At Harmon, 33 miles from Grand Central Station, is the general repair shop, and to this point all of the inspection

work will be transferred on the completion of the electrification of the Hudson division.

The main portion of the shop has a 450-ft. frontage and is 190 ft. deep. There is an L-extension on the east end, 60 ft. wide and extending 260 ft. beyond the rear wall of the main building. This L-extension, to be used for car and locomotive inspection work, has three longitudinal tracks, two for cars, each having a capacity for six cars, while the third will take ten locomotives. The electric locomotive repair shop adjoins the inspection shed and has four longitudinal tracks. The car repair shop is separated from the locomotive shop by a heavy wall and has ten tracks for two cars each. At present the two tracks at the western end are used for truck repairs. Several repaired trucks are always kept in stock, so that they may be substituted for damaged or defective ones. The machine shop occupies the western end of the building, and is 75 ft. wide by 190 ft. deep. The 30-stall roundhouse will be built just west of the shop, so that the machine shop will be between the electrical and steam work. The shop offices occupy the second floor above the machine shop.



Tests of Oil Consumed by Two Cars.

FORM E. E. 10. C.M.E. 1-19-10-900.

New York Central & Hudson River Railroad Co.

ELECTRICAL DEPARTMENT

Messrs. Bickford / Bullock / Ryan & Van Atten / Sears — New York, April 9 1910

Mr. _____

Dear Sir: Below please find the mileage of Electrical Car Equipment for the 24 hours ending 11:59 P.M. April 8 1910

Car Number	Mileage	Car Number	Mileage	Car Number	Mileage	Car Number	Mileage	Car Number	Mileage
3000	482	3030	---	3060	779	3090	97	3120	424
3001	154	3031	604	3061	584	3091	210	3121	1024
3002	932	3032	752	3062	~~1172 X~~	3092	807	3122	518
3003	564	3033	578	3063	~~1041 X~~	3093	78	3123	270
3004	280	3034	890	3064	1054 X	3094	614	3124	336
3005	602	3035	984	3065	614	3095	97		
3006	164	3036	34	3066	1065 X	3096	937		
3007	348	3037	---	3067	834	3097	34	4394	
3008	---	3038	208	3068	386	3098	58	4395	
3009	---	3039	984	3069	---	3099	48	4396	
3010	408	3040	698	3070	---	3100	904	4397	
3011	290	3041	561	3071	~~1038~~	3101	1004	4398	
3012	634	3042	612	3072	464	3102	620	4399	
3013	96	3043	544	3073	~~968~~	3103	----		
3014	326	3044	630	3074	634	3104	154		
3015	590	3045	116	3075	797	3105	566	4350	
3016	874	3046	---	3076	916	3106	96	4351	
3017	630	3047	154	3077	398	3107	967	4352	
3018	700	3048	592	3078	---	3108	950	4353	
3019	---	3049	192	3079	651	3109	---	4354	
3020	499	3050	400	3080	---	3110	714	4355	
3021	144	3051	~~1190 X~~	3081	~~1348 X~~	3111	436		
3022	~~1198 X~~	3052	724	3082	436	3112	---		
3023	606	3053	851	3083	1044	3113	348		
3024	~~1084 X~~	3054	510	3084	1088 X	3114	1054 X		
3025	---	3055	154	3085	716	3115	---		
3026	~~1045~~	3056	960	3086	352	3116	---		
3027	512	3057	1063 X	3087	987	3117	204		
3028	584	3058	702	3088	555	3118	960	10	Cars for inspection at 10 A. M.
3029	~~1048~~	3059	614	3089	705	3119	594		

Daily Mileage Report.

The following machine tools are installed in the machine shop:

Wheel press, 500-ton, Niles-Bement-Pond, New York.
Horizontal boring mill, single head, Putnam Machine Co., Fitchburg, Mass.
Horizontal boring mill, double head, Bullard Machine Tool Co., Bridgeport, Conn.
Shaper, Gould & Eberhardt, Newark, N. J.
Lathe, 16-in., Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.
Lathe, 30-in., Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.
Lathe, 24-in., Lodge & Shipley Machine Tool Co., Cincinnati, Ohio.
Axle lathe, double head, Niles-Bement-Pond, New York.
Tool lathe, Henley Machine Co., Torrington, Conn.
Slotter, 18-in., T. C. Dill Machine Co., Inc., Philadelphia, Pa.
Plate rolls, 72-in., Niles-Bement-Pond, New York.
Combination punch and shear, Hilles & Jones Co., Wilmington, Del.
Bolt cutter, double head, Acme Machinery Co., Cleveland, Ohio.
Bolt cutter, single head, Hurlburt-Rogers Machine Co., South Sudbury, Mass.
Planer, 30-in., double head, Niles-Bement-Pond, New York.
Drill press, 4-spindle, Bickford Drill & Tool Co., Cincinnati, Ohio.
Drill press, Cincinnati Machine Tool Co., Cincinnati, Ohio.
Radial drill, Bickford Drill & Tool Co., Cincinnati, Ohio.
Pipe threading machine, D. Saunders' Sons, Yonkers, N. Y.
Car wheel lathe, double head, Niles-Bement-Pond, New York.
Driving wheel lathe, Niles-Bement-Pond, New York.

All of these machines are new with the exception of the driving wheel lathe. The larger ones have individual motor drives, and the smaller ones are in motor driven groups.

Provision has been made for future extensions as follows: An inspection shed equal in size to the present one; a car repair shop about two-thirds the size of the present one, and an extension on the machine shop which will be slightly more than double its present size.

The car repair shop is equipped with three 18-ton electric traveling cranes, made by Alfred Box & Co., Philadelphia, Pa. When fully equipped, this shop will have five of these cranes, each serving two tracks. The crane service in the machine shop will consist of five 2½-ton electric telpher hoists. The shop now has one 5-ton Sprague Electric Co., New York, telpher hoist which serves the middle of the shop.

One corner of the machine shop is devoted to air brake work and another to the repair of electric motors; adjoining this is the tool room. The general storehouse for the electric division is located at Harmon and at present occupies a portion of the machine shop end of the building. The blacksmith shop contains two forges, one steam hammer made by the Chambersburg Engineering Co., Chambersburg, Pa., and one double wheel emery grinder.

In the power room are three Western Electric, 150-volt, 220-amp., d.c., generators, direct connected to vertical engines made by the Shepherd Engineering Co., Franklin, Pa.; one underwriters fire pump of 1,500 gals. per minute capacity, sufficient to maintain six 1⅛-in. smooth nozzle fire streams; one

FORM E. E. 2-A. C.E.E. 2-2-10-1K.

New York Central & Hudson River R. R. Co.

ELECTRICAL DEPARTMENT.

DAILY REPORT ON EQUIPMENT.

Date April 11 1910. Ending 6 P. M. Location No. W. Plains

FORCE	DAY	NIGHT	EQUIPMENT	O. K.	Disabled
Foreman	1		Motor Cars		
Inspectors and Helpers	17	4	Trailer Cars		
Repair Men	1		Combination Cars		
Laborers		1	Electric Engines		
Car Cleaners and Wipers					
Oilers and Hostlers	4				
Total No. of Men on duty	23	5			

Numbers of Cars Received	Date Received	Date of Cars Shopped	Class of Repairs	Date to be Ready for Service	Date Ready for Service	REMARKS
3066	4/9	4/9	Insp.	4/9	4/9	Went South in Service this A. M.
3081	"	"	"	"	"	
3026	"	"	"	"	"	
3029	"	4/11	"	4/11	4/11	
3051	"	"	"	"	"	In Yard
3062	"	"	"	"	"	
4063	4/10	"	"	"	"	
4071	"	"	"	"	"	
3073	"	"	"	"	"	
4300						
4307						
4303						Extra Cars
3369						
3396						
3345						
Engine						
3221	4/11	4/11	Insp.	4/11	4/11	Gaged Shoes O.K. Adjusted Brakes 5½" to 5"
3229	"	"	"	"	"	" " " " " 5½" to 5"
3345	"	"	"	"	"	" " " " " 6" to 5"
3223	"	"	"	"	"	" " " " " 5½" to 5"
3234	"	"	"	"	"	" " " " " O. K.
3216	"	"	"	"	"	" " " " " O. K.

I CERTIFY THE ABOVE TO BE CORRECT.

(over) H. L. Bullock Foreman

Daily Equipment Report.

Cochran feed water heater and receiver, made by the Harrison Safety Boiler Works, Philadelphia, Pa.; one compressor of 1,500 cu. ft. of free air per minute capacity, made by the Chicago Pneumatic Tool Co., Chicago; and a motor-generator set. The boiler room contains five 100-h. p. locomotive type, hand fired boilers, two of which are used at a time during the summer and three in winter when additional steam is required for heating purposes.

The Harmon shop does not now handle any inspection work, except on those cars which have reached the shop and have made the mileage necessary for general inspection.

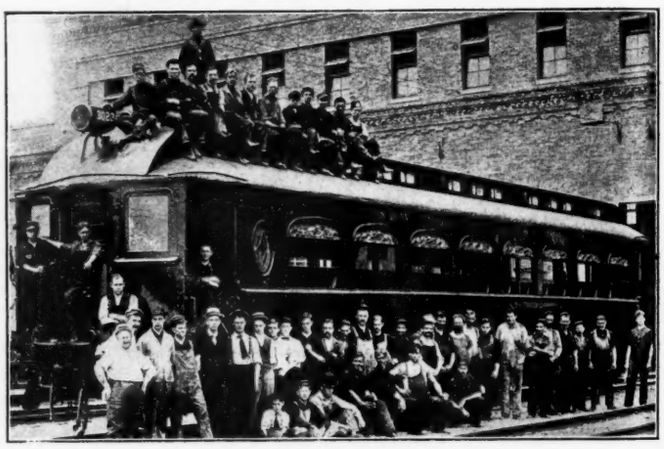
The pits in this shop are especially adapted for car work. They are 32 in. deep and have steps leading into them at the ends. The shop floor, level with the top of the rails at the ends of the pits, gradually slopes down from the pit line to 14 in. below the top of the rail. This puts the car or locomotive in an advantageous position for working on the running gear.

The cars are equipped with radial draft gear, which, on account of its extending to the track bolster, is often bent if the car is handled roughly. These are quickly straightened by placing a rail across the buffer plate, anchoring its ends to the rails and then lifting up on the car end with an electric crane hoist.

Six combination passenger-baggage motor cars are being built. They are being made from trailer cars by cutting the baggage doors near one end. The metal is cut by a circular saw, motor driven. This method is rapid and does not damage the sheets.

INSTRUCTION OF ENGINEMEN AND FIREMEN.

The enginemen and firemen who handle the electric locomotives, and the motormen who operate the multiple unit trains, are recruited from the steam department. These men require instruction only in handling the electric equipment, being acquainted with the train operation generally. R. E. Hewitt, an engineer who has had an extensive experience in the electrical field in connection with both the manufacture of



Harmon Force.

For general repair work.

electrical equipment and the operation of electric surface, elevated and subway lines, is in charge of the instruction of enginemen and firemen. The equipment is described by the instructor and the men question him when any point is not understood. After going over the electric locomotive and the motor car equipment thoroughly and answering all questions, the instructor has the men make note of the more important points in small note books. During the course of instruction special stress is placed on service troubles and methods of handling them on the road. A number of men may be taken out on the line with a locomotive or train and common service troubles may be made to occur by the instructor. For instance, if the main control, negative control or 40-amp. fuse is blown, or if the switch in any one of the fuse boxes does not make good contact, it is impossible to move the engine. This condition is illustrated by removing a fuse or only partly closing a switch. The buss and train line jumpers are explained and their functions illustrated.

The instructor also impresses on the men the importance of making full and immediate reports of all service troubles. The renewing of a lamp switch fuse is sufficient cause for a report, as its blowing out may be a tell-tale to some more serious trouble, which, if not discovered when the locomotive reaches the inspection shed, may cause trouble the next trip.

C. H. Quereau is superintendent electrical equipment and we are indebted to him for many courtesies and privileges extended. E. Sears is general foreman at Harmon, J. Van der Bogart is foreman at High Bridge and H. L. Bullock at North White Plains, to whom we are also indebted for assistance.

MASTER BOILER MAKERS' ASSOCIATION.

The fourth annual convention of the International Master Boiler Makers' Association was held at Niagara Falls, Ont., May 24-27. The following subjects were reported upon and discussed: The Standardizing of Blueprints for the Building of Boilers; Best Method of Applying and Maintaining Tubes; Flexible Staybolts Compared with Rigid; Steel vs. Iron Tubes; Standardizing of Shop Tools; Standardizing of Pipe Flanges for Boilers; Best Method of Staying the Front Portion of the Crown Sheet on Radial Stayed Boilers; Radical Departures in Boiler and Firebox Construction; Extent of Cracking of Firedoor Holes and the Means of Prevention.

Radical Departures in Boiler and Firebox Design.—The paper dealt exclusively with the locomotive boiler and gave descriptions of the Wood and Jacobs fireboxes, the brick combustion chamber in use on the Central of Georgia and the several types of boilers that have been applied to Mallet locomotives. The discussion, however, hinged about the Wood and Jacobs fireboxes and dealt especially with the value of corrugations as a preventative of staybolt breakages. It was considered too soon to make any positive statements as to the probable life of the Jacobs firebox, but in a year's service no repairs have been necessary except the calking of the tubes. The Wood firebox was criticised on the basis that the staybolts should be put in the convex portion of the sheet instead of the concave, and that this location causes them to leak. Further than this it was stated that it was exceedingly difficult to patch the box.

The discussion drifted into the consideration of corrugated sheets generally. It appeared that many members had had experience with corrugated side sheets. It was shown that the corrugated sheets in use some twenty years ago had developed a tendency to crack and had been generally condemned, and even where they had not failed their use was discontinued. In one case side sheets with horizontal corrugations were used because it was thought that the inequality in vertical expansion between the inner and the outer sheets was what should be cared for. It worked well for a time, but after 28 months of service the sheets began to crack and could not be patched. From this and other experiences the speaker had reached the conclusion that when the life of the ordinary flat side sheet is not more than two years it will pay to use a corrugated sheet. Not because a longer life will be secured, but because during the life of the sheet there will be less trouble with leaky staybolts. But, if the life of the sheet is more than two years, nothing will be gained by using a corrugated sheet.

The scale seems to be the greatest enemy to the life of a corrugated sheet. The incrustation forms in the hollows and cannot be readily removed, thus resulting in cracking, though there may be a great improvement in the leaky staybolts. It is not at all uncommon to find from ½ in. to ⅝ in. of scale on these sheets.

Closely allied to the matter of corrugation is that of the radius of curvature used in the flanging. Various radii have been used up to as much as 3 in., with the idea of easing off on the bending stresses. These large radii do not seem to have been successful and it was the general consensus of opinion that a radius of ¾ in. was better than a longer one though it was not so stated officially. The variations in the experiences with corrugated sheets was accounted for by the variations in material, water and usage. Where the water was good, and the material also, it was possible to get good results; but with material that was anything but first class or with water yielding a high per cent. of incrusting matter, the corrugated sheet would be sure to crack and fail, though it might afford a temporary relief from leaky staybolts.

It was also intimated, though not directly stated, that the use of the corrugated sides and crown had given little or no relief in the matter of the broken flange of the back tube-sheet.

Inequality of Expansion in Locomotive Boilers.—The paper on this subject, presented before the New York Railroad Club by D. R. MacBain, was read. An abstract of it appears in the *Railway Age Gazette* May 27, page 1311.

Standardizing Pipe Flanges for Boilers.—The committee merely recommended the adoption of the standards already offered by the American Society of Mechanical Engineers; also some used in Canada and a few used by Crane & Co.

Staying the Front End of the Crown Sheet in Radially Stayed Boilers.—The committee reported to the effect that no method of bracing has yet been designed to entirely eliminate bending and cracking at the top flange of the flue sheet of radial stayed boilers; a 2-in., 3-in. and as much as a 6-in. radius have been tried at the top of the flue sheet to overcome the cracking with no better results than were had with the usual ¾-in. radius. Although the primary cause of the bending and cracking is the stretching or lengthening of the flue sheet, it is obvious that the inelasticity of the crown sheet prevents it from readily adjusting itself to the increased length of the flue sheet. This condition is wholly responsible for the bending of the flange and largely so for the cracking.

While the initial cause of the stretching, distortion and cracking is the abuse of the flue sheet, it is evident that if it were free to move at the top, there would be no bending or consequent cracking of the flange. Increasing the margin above the flues mitigates the evil somewhat, but does not eliminate it. In good water districts very little trouble is experienced with the top of the flue sheet in radial stayed boilers. It is in the bad water districts, as a rule, where the flue sheet is abused with the sectional expander, on account of flue leakage, that the trouble occurs.

Other cases of kindred firebox sheet failures are cracks in the lower half of side sheets along the calking edge of the flue sheet, longitudinal cracks in the crown sheet along the calking edge of the side sheet, and longitudinal cracks in the quadrant of the wrapping sheets, all due to unequal expansion.

Another serious condition found in connection with the tee bar arrangement is a deflection in the crown sheet of from ¼ in. to ¾ in. at either end of the tee bar due to the tee bar coming down at the ends, and the crown sheet going up just beyond the tee bar; the radius of the tee bar becoming smaller to such an extent that when a new flue sheet is applied it is necessary to change the radius of the bar. This condition does not exist where the eye bolt and sling stay or some other more flexible form of stay is used.

A modified form of the radial stayed boiler is in use, with a flat crown sheet, having tee bars on the crown and roof sheet connected by braces. The crown sheet has a smaller radius at the sides than the one ordinarily used. These crown sheets are said to crack, in time, longitudinally along the bend. The crown bar and the Belpaire boiler are said to be more satisfactory as far as the upper flange of the flue sheet is concerned.

In the discussion it was suggested that some relief could be obtained from the cracking of the tube sheet flanges by leaving a wider margin above the top rows of tubes. Also that the plugging of a flue hole was apt to stretch and strain the metal so as to make trouble. It was generally conceded that the firebox held by radial stays gave more trouble than either the crown bar or Belpaire type. This was explained on the basis of the difference in the dimensions of the inner and the outer sheets, as well as the shape in which the crown sheet has a tendency to arch up. Under ordinary conditions of construction the sling stays and T bars are very rigid so that the ordinary radial stays are quite as good.

It often happens, however, that where a flange breaks the material is blamed, whereas it may be altogether due to the

treatment that the material has received, for work may have been done upon it at too high or too low a temperature. The best heat for this flanging is a bright cherry red, and cracking may result from working it when too hot as well as when too cold.

Excellent results have been obtained by what was called a modified form of Belpaire firebox, where the inner sheet was made to agree with the outer in general contour; with such a design there had been no failures in four years.

Horizontal cracks may be formed because of the lack of any provision to take care of the vertical expansion of the firebox, so that it is well to make the holes in the sling stays oblong and of ample length to take care of this upward expansion. This is especially necessary in bad water districts. Gusset stays also seem to help matters under these conditions.

The method of setting the tubes also has an important influence on the stretching and cracking of the flange of the tube sheet. It has been found to be better to start the expanding of the tube at one side and go around and around the nest, gradually working in towards the center. If this is done, the metal of the tube sheet is being constantly worked in towards the center, and the expansion is in that direction. The result is that the sheet can and does bulge either to the front or back, and when all of the tubes are set it is in a condition of equilibrium. Whereas, if the expanding is done from the center to the outside, there is a great upward pressure put upon the flange connection to the crown sheet with the corresponding danger of cracking.

In this connection the flexible staybolt may be considered a good thing provided the tubes have been properly set. But if the tube sheet has been stretched by an improper setting of the tubes they will be of but little value in preventing the cracking of the flange.

Cracking of Fire Door Sheets.—Closely allied to the cracking of the tube sheet is the cracking of fire door sheets, upon which a report was presented. It started out with the broad statement that cracked door sheets were almost as common as leaky tubes, though not as harmful to the steaming qualities of the locomotive. The trouble seems to be a universal one regardless of the shape of the door opening. The committee laid the cause of the trouble not on the abuse to which the metal had been subjected in working, or the cooling effect of the air, but to the "breathing" movement of the sheets from unequal contraction and expansion. This is demonstrated by the fact that the fractures always develop on the inside of the knuckle first, and radially with the various curves of the hole. It was suggested that any contemplated changes should be along the lines of stiffening the connection between the two plates.

In the discussion it was shown that the O'Connor door opening invariably gave satisfactory results provided it was properly applied. The O'Connor door has a swell on the inner sheet that forms a flexible connection by which a considerably relative movement between the two sheets is permitted without overstraining the metal. It is necessary that the staybolts should be kept well away from the opening so that it may not be too rigid. No staybolt should pass through the swell.

As far as the shape of the door is concerned it has no influence whatever on the cracking. The elliptical or oblong door does, however, possess the disadvantage of affording a place at the top for the accumulation of scale. One door was described that had larger radii in the upper than in the lower corners. With this the cracks usually occurred in the lower corners.

In the construction of the door flanges it has been found that a radius of ¾ in. is as good as a larger one. And as for repairing, most excellent results have recently been obtained by welding in patches. This has been done on both sides of the door and so neatly that the location can hardly be detected. But, if a patch is to be put on in any other manner it is best to use a latch bar and drive the rivets all of the way around and not use bolts.

Steel vs. Iron Tubes.—The report was very short and to the effect that "steel tubes give just as good service as iron tubes and *vice versa*." As for welding, where an oil furnace is used there is no difficulty or secret in welding steel tubes. In an open coke or coal-fire some difficulty is encountered, due to the impurities in the fuel.

A statement was presented from the Erie from which it appeared that the total cost of working the same number of steel and iron tubes was about 20 per cent. more for the iron than for the steel. Another report showed a very favorable relation to exist for steel tubes. Out of 298 tubes of steel and iron, half and half, making 103,663 miles, 14 steel tubes were found pitted and scraped. In the same lot there were 49 iron tubes that had to be scraped. Neither kind give any very great amount of trouble when in use. In another case, there were 26 scrap steel and 20 scrap iron tubes. In a third 20 scrap steel and 6 scrap iron tubes. In some cases the beading of the steel was found to be in good condition, while that of the iron was soft and spongy. It, therefore, appears that on the whole there is not much to choose between the steel and the iron tubes.

Flexible Staybolts and the Best Methods of Applying.—The report was merely a statement of the successful operation of flexible staybolts upon a heavy locomotive. In the discussion it developed that this type of bolt is giving splendid satisfaction. One member reported that on locomotives with full installations, no broken bolts had been found in 30 months' service. It appears, too, that the bolt is doing much to preserve the fireboxes. Where the flexible bolts are applied the firebox sheets remain smooth and flat; whereas, with the rigid bolts they become corrugated or cracked. It was thought that if complete installations were put in, and three or four rows of sling stays were used at the front in addition, there would be no trouble in the bulging or cracking. From only one road did there come any report of broken bolts and these were in the outer rows of the throat sheet of a Wootten firebox.

As for the method of inspecting flexible bolts, it is a matter of some difficulty to get satisfactory results. They should be inspected at least once every 30 days as a precautionary measure, even though breakages are almost unknown. The methods used are to put on an air, steam or water pressure of from 100 lbs. to 125 lbs. per sq. in. and then tap the bolt on the inside with a hammer. Of the three, the use of water pressure has proven to be the most satisfactory.

The breakages, when they do occur, are invariably found immediately under the head. A cause for this breakage was given in the carelessness which sometimes obtains in the tightening. If a bolt is drawn down too tight with a long handled wrench, it follows that it must carry an excessive load that may result in fracture. But, if they are properly put in, a number of speakers seemed to think that there could be no danger of breakage.

At the conclusion of the discussion the association voted that in its opinion the use of the flexible staybolt was the best known means of relieving the strains of expansion and contraction in the sheets.

Applying Tubes.—The opinion of the committee was that the best method of applying tubes is to have them fit perfectly tight in the copper ferrule. The copper should be tightened in the sheet with a sectional expander, and should not be rolled. Then, to tighten the tubes, use a roller expander and a small motor, and do just enough work to hold the tube while belling out. They should then be expanded with a Prosser expander that $\frac{1}{16}$ in. wider than the thickness of the sheet, and beaded with a standard beading tool.

The best method of caring for tubes while on the road is to have them kept clear of all cinders and soot, and to avoid

all sudden changes of temperature in the firebox by opening the fire door to prevent the boiler from popping; keep a good, live fire next to the tube-sheet, maintain a regular delivery of the feed, in short, keep the temperature in the boiler as uniform as possible and a clean fire.

Where arch tubes are used they are a great protection, especially if the arch is set close to the tube-sheet, where it can prevent the cold air from striking the tubes. In such cases there is little trouble from leaky tubes, and engine failures as a result thereof. As a precautionary measure, the tubes and the top of the arch should be cleared of cinders whenever the boiler is washed out. On the Lake Shore & Michigan Southern the tubes are expanded with a Prosser expander every thirty days, whether they need it or not. It may seem useless, but the recompense comes in not having any tube failures on the road.

The tools recommended for the work are a Prosser expander and a standard beading tool to conform and take in $\frac{3}{16}$ in. stock to the firebox end.

On the Rock Island the practice is to cut off any excess of metal that may have developed by flow or otherwise and to ream out the holes, into which the copper ferrules are fitted and rolled. The tube is then entered and beaded about 2/3 down and is then expanded with a Prosser expander and calked. It was urged in behalf of this method that it insured an even expansion of the tube when the sheet was awry. Under such circumstances any upsetting that takes place will be at an angle with the tube and will make the work uneven unless this method is employed.

Another member used a Prosser expander with a long stroke hammer every 30 days. There was some difference of opinion as to the value of using a belling tool to square the end of the tube, and as to the best method of turning the tube over. It was especially urged that it would be far better to straighten the sheet, and that this should always be done; for, when a sheet is out $\frac{1}{8}$ in. in the width of the tube hole it is time to make it right.

While no formal action was taken it was generally considered that a time limit should be put on the life of tubes, and that three years is the maximum that they should be allowed to remain in place without renewal. It was also recommended as especially advantageous to the circulation and for the strengthening of the bridge between tubes to reduce a $2\frac{1}{4}$-in. tube to 2 in. by welding on a 9-in. piece at the firebox end. This is especially true when the dome is immediately over the tubesheet, where it seems to have a tendency to lift the water, unless this improved facility of circulation is provided. It has also been found that tubes so reduced are much more easily kept clean, because anything that enters the 2-in. portion is very easily swept along out of the larger section.

The use of but two sizes of copper for ferrules was deprecated in that, when the holes were reamed out, they would not always fit, and it would be better to keep five or six sizes in stock, from which one could always be found that would fit the hole. It was added in the final discussion that the life of tubes was sometimes doubled by using this reduction at the back end.

Standardizing Drawings.—It was urged that this standardization be made to include the form and method of laying out of certain parts of the boiler, such as back heads and throat sheets so that the work can be done in advance of the bringing of the engine into the shop for repairs. This should also include the foundation ring, which should be finished inside and out and all holes laid off from accurate skeleton box templates with center lines and holes, both longitudinal and transverse; all holes to be drilled before assembling sheets, except the plug holes in the outside corners which may be drilled after the sheets are laid off.

Again all flanged work should be turned and fitted accurately to box or band templates at the flange fire; all the firebox plates should be laid off accurately from template for rivet holes. The same should be true for holes in the back head, side and roof sheets. The cylinder courses should be bisected; the dome collar should be put up and fitted. There are other matters that should be taken into consideration, which would tend towards the development of a cheaper maintenance as well as construction. It was also shown that this matter was one that could not be carried forward without the assistance and co-operation of the superintendents of motive power. It will be necessary to secure their co-operation but it was thought that if the economy resulting from this standardization was shown them that the manufacturing companies could be brought into line to work in accordance with such recommendations as might be made.

Federal Boiler Inspection.—At the closing session there was an animated discussion condemnatory of the Federal bill, S. 6702, providing for governmental inspection of locomotive boilers. At the end of the discussion the following resolutions were passed unanimously:

Whereas, A bill known as No. S. 6702 has been presented to the Congress of the United States for the avowed purpose of promoting the safety of employees and travelers upon railways by compelling all common carriers to equip their locomotives with safe and suitable boilers and appurtenances thereto, and,

Whereas, The language employed in the said bill by which such safety is to be obtained is indefinite and uncertain and in no way conveys any engineering information whatever that can serve as a guide for boiler construction and maintenance, and,

Whereas, The bill provides for a system of inspection that is impossible of execution with the force that will be available, thus rendering it absurd and useless, and,

Whereas, There is no method suggested by which competent inspectors will be selected, and,

Whereas, It provides that the government will undertake the inspection without assuming any responsibility for the same, and,

Whereas, Such a system of inspection will tend to lessen the vigilance of employees without, at the same time, relieving them of responsibility, and,

Whereas, The training of the men made eligible for inspectors is not sufficient to insure their competency, and,

Whereas, Such a system of inspection will hamper commerce by delaying engines at terminals, and,

Whereas, The expense involved will be very great without any compensating advantages therefor, and will, therefore, be a burden to maintain; therefore be it

Resolved, That we, the International Master Boiler Makers' Association, condemn the said bill, S. 6702, as it is now drawn, as not only useless but detrimental to the best interests of the railways, their employees and the traveling public, and unanimously deprecate its passage and urge that it be reported unfavorably, and that it be further

Resolved, That copies of this resolution be sent to congressmen and senators in charge of the bill and members of the Interstate Commerce Commission and the press.

The following officers were elected: President, A. M. Lucas, general foreman boiler maker, Chicago, Milkaukee & St. Paul, Milwaukee, Wis.; first vice-president, Geo. W. Bennett, general foreman boiler maker, New York Central & Hudson River, Albany, N. Y.; second vice-president, J. W. Kelly, general foreman boiler maker, Chicago & North Western, Oak Park, Ill.; third vice-president, T. W. Lowe, general boiler inspector, Canadian Pacific, Winnipeg, Man.; fourth vice-president, John T. Johnson, assistant boiler inspector, Atchison, Topeka & Santa Fe., Los Angeles, Cal.; fifth vice-president, F. A. Linderman, boiler inspector, New York Central & Hudson River, Albany, N. Y.; secretary, H. D. Vought, 95 Liberty street, New York; treasurer, Frank Gray, foreman boiler maker, Chicago & Alton, Bloomington, Ill.

Omaha, Nebraska, was selected as the place for the holding of the next convention.

General News Section.

The fourteen railways centering in Denver and vicinity have increased the pay of yardmen 3 cents an hour.

The Pennsylvania Railroad has renewed for 20 years, from July 1 next, its general contract with the Pullman Company.

The Toledo & Ohio Central has agreed to increases varying from 14 to 38 per cent. in the wages of its conductors and brakemen.

The Pennsylvania, which now uses telephones for a large part of its business west of Harrisburg, is preparing to introduce them on the main line east of Harrisburg.

Gov. Hadley of Missouri is quoted as saying that representatives of the railways in that state have informed him that they will equip all locomotives with acetylene headlights.

The Missouri Pacific has adopted the open-shop system so far as the machine departments of the shops at Little Rock, Sedalia and other important points are concerned. Non-union machinists are being engaged.

The St. Louis & San Francisco is installing new telephone circuits for train despatching on about 500 miles of line; from St. Louis to Springfield, from Springfield to Thayer, and from Amory, Miss., to Birmingham, Ala.

The New York legislature has passed an amendment to the labor law providing for the making of voluntary agreements between employers and employees as a basis for compensation in case of the death or injury of the employee. Railway corporations are expressly exempted from the application of this amendment.

The New York State Superintendent of Public Works has awarded barge canal contract No. 63 to H. S. Kerbaugh, Inc., of Philadelphia, for $1,990,043, and No. 73 to E. H. Graves of Cleveland, O., for $767,467. Contract No. 63 is for the improvement of twelve miles of the Erie Canal in Monroe County, and No. 73 for dredging a channel in the Hudson River between Northumberland and Stillwater, 15 miles.

The Western Electric Co., which has furnished a very large proportion of the telephones now used by the railways of the country for train despatching, is now putting on the market a selector of its own design, which is claimed to be the simplest yet made. It is a simple step-by-step apparatus, and requires no local battery or relay at the way station. No polarized circuits are used and tests have shown the instruments capable of high speed combined with accuracy.

It is reported that the Order of Railway Telegraphers has won its contention with the Missouri Pacific and allied lines for an eight-hour day in all large offices. About 1,000 men are affected by the agreement. The telegraphers had been working nine hours with time and a half for all time worked over nine hours. Hereafter the overtime will commence with the ninth hour instead of the tenth. In offices where two telegraphers are employed the day will consist of nine hours, overtime being paid for work longer than nine hours.

Messrs. Clark and Morrissey, arbitrators in the dispute between the New York Central and its conductors and trainmen, have decided against the Delaware, Lackawanna & Western in the claim made by that road that certain clauses in the New York Central arbitration applied also to the Lackawanna. These clauses are those in which certain increases of pay on the New York Central were ordered to take effect several months in the future. The present decision is in effect that on the Lackawanna all of the increases are to go into effect at once.

E. F. McPike, refrigerator service agent of the Illinois Central and secretary of the Railroad Refrigerator Service Association, has been appointed the delegate of the association to the second international congress of refrigeration to be held in Vienna, Austria, October 5 to 11, 1910. The railways of this country have in service about 100,000 refrigerator cars, and improvements are being made in their construction continually. These international meetings of men interested in refrigeration furnish an opportunity for exchanging ideas and profiting by experience gained in other countries.

On Saturday, May 21, the Michigan Central ran an excursion train of 12 cars, all well filled, from Windsor, Ont., to Falls View station, 224 miles, in 224 minutes; and, following this, another train of the same length made the same distance in seven minutes less; and both trains ran through without a stop. In making these fine runs the road had what in scriptural language might be called a great cloud of witnesses, or rather two great clouds. All of the passengers in both trains were critics of the highest grade; they were members of the Brotherhood of Locomotive Engineers, who had been holding their great biennial convention in Detroit.

Railway Matters in Washington.

Washington, June 1, 1910.

Senator La Follette has finished his three days' speech denouncing the principal provisions of the administration railway bill, and Senator Cummins has so far succeeded in his endeavors to secure a variety of amendments that he has gone home to Iowa for ten days or more. The action of these two senators does not, however, give the promise of an immediate vote on the bill, as had been expected, for a number of other senators have now proposed other amendments. Most of these recent proposals are nothing more than attempts to reopen questions which were settled two or three weeks ago by the adoption or rejection of amendments which had been long considered, so that at present the prospects are again considerably mixed. Among the amendments which have been adopted in the Senate is one providing for the supervision of telegraph and telephone companies by the Interstate Commerce Commission. A provision with this purpose was adopted in the House, but this one is different in some respects. Senator Cummins' amendment to require all increases in rates to be approved beforehand by the Commission, was rejected by a vote of 29 to 43. Following this, the Senate adopted unanimously an amendment proposed by Senators Jones and Paynter, giving the Commission ten months instead of four months to consider proposed increases, provided the Commission is not able to complete its examination of the tariffs within four months. The section regulating the issue of stocks and bonds was stricken out by an almost unanimous vote.

An amendment offered by Senator Cummins was adopted providing that in all cases where an increase of rates, which has been made since January 1, 1910, is challenged, the burden of proof to show the new rates just shall rest on the carrier.

On Monday last a large delegation of shippers from the Middle West, accompanied by 20 Congressmen, called on Attorney-General Wickersham and asked him to take action in the courts under the anti-trust law against the railways in the Western Trunk Line Committee, which have announced radical increases in freight rates to go into effect June 1, and yesterday the Attorney-General complied with their wishes by asking for an injunction in the United States district court of Hannibal, Mo. The court granted a temporary injunction and the court will fix an early date for a hearing on the question of issuing a permanent injunction. The defendants are all of the roads in the Western Trunk Line Committee, which means all of the principal companies between Chicago and the Missouri river as well as a number of others. The petition charges that in organizing the Western Trunk Line Committee these roads were suppressing competition; that at their monthly conference, if a road suggests a change in rates and the other roads agree to it unanimously, the change takes effect, and all members are thus guilty of combining.

The attorney-general's visitors were largely from a meeting held at Omaha, May 24, when representatives of shippers of 15 cities, most of them west of the Missouri river, met and ap-

pointed the committee, instructing it not only to go to Washington to file a complaint, but also to induce shippers to bombard their representatives in Congress with telegrams denouncing the advances in rates. This was done and for a day or two telegrams flooded the capital. The committee was headed by W. J. Evans, of Chicago.

Mail Bag Delivering Apparatus.

The recently announced order of the Post Office Department relating to the use of improved devices for catching and delivering mail bags at points where trains do not stop, was in the shape of a letter from the second assistant postmaster general to the general superintendent of the Railway Mail Service, instructing him to see that all railway companies be notified that "they would be expected to take steps within one year to equip their lines with either the Burr device or some other equally satisfactory." The Burr device was described in the *Railway Age Gazette* of October 15, 1909. We are informed by Mr. Hollyday, acting second assistant postmaster general, that a number of the larger railways are taking steps to co-operate with the Post Office Department by looking into the merits of the Burr device or by testing other devices of their own selection.

Delays of Cars at Interchange Points.

In its report to the semi-annual meeting, held in New York recently, the American Railway Association's committee on relations between railroads presented the table given herewith, showing reasons for the rejection of cars by inspectors at 14 prominent cities for the month of November last. It will be seen that 77 per cent. of the rejections were due to mechanical reasons and 23 per cent. to transportation reasons; and that a large majority were due to causes entirely foreign to defective safety appliances.

The committee reports that a plan for a joint inspection and interchange bureau has been experimentally adopted at the Union Stock Yards, Chicago, under the auspices of the General Superintendents' Association. The plan is similar to that in effect at Pueblo, Colo., and heretofore described. The plans in use at Pueblo, Denver and Cincinnati continue to give satisfactory results.

Albany to New York by Airship.

On Sunday last, May 29, Glenn H. Curtiss flew from Albany to New York City, 137 miles, in three hours 32 minutes, and he won a prize of $10,000 which had been offered by the *New York World*. He stopped for rest for just one hour, at a point near Poughkeepsie, about half way, so that his actual time in motion was two hours 32 minutes, for the 137 miles, an average rate of 54.06 miles an hour. He landed near the northern part of Manhattan island, thereby complying with the conditions of the prize giver, and then resumed his flight and finally landed on Governor's island, New York harbor, about 15 miles farther south. The aeroplane was fitted with floats to prevent sinking in case it should fall into the water, and the flight was over the Hudson river all of the way, except in a few places where distance was saved by cutting across the land. The motor of this aeroplane is 50 h.p., and the whole machine, with the man in his seat, weighs about 1,000 lbs. About seven gallons of gasolene was used in the trip from Albany to Poughkeepsie, the capacity of the reservoir being ten gallons. Curtiss started from Albany at 7:03 a. m., and reached Poughkeepsie at 8:26; left Poughkeepsie at 9:26 and reached Spuyten Duyvil at 10:35. This flight was not so long as that of Paulhan from London to Manchester, 186 miles, recently made, but surpassed it in speed. At Storm King a gust of wind caused Curtiss' machine to drop suddenly about 40 ft. or more, but the aviator succeeded in righting it quickly. Mr. Curtiss' wife and friends started from Albany in a special train over the Hudson division of the New York Central a few minutes after he set sail, and followed the flight through, keeping the airship in view a good part of the way.

Increase in Night Letter Telegrams.

Many uses have been found for the night letter telegrams which were not even thought of by the originators. One Chicago concern sent out in one night 1,000 50-word telegrams, advertising its products. The results were so satisfactory that it is said the same firm will send out 10,000 more similar telegraph letters in the near future. Many brokers who are accustomed to send out daily market reports to customers throughout the country, are using the night letter telegrams for this purpose. On one night recently two New York business houses sent 4,200 and 4,400 night messages respectively. In a telegraph office in a small southern city where one operator would ordinarily handle all of the night business 500 letter telegrams were filed recently in one night.—*Telegraph Age.*

Hints to Station Agents.

In prohibition Kansas some of the express companies send peculiar complaints to the railroad commissioners. A Cloud county man recently filed a long complaint with a certain company against its local agent. "Whenever I receive a shipment of liquor," said the man, "the agent tells all the old topers in town, and they hound me to death for social drinks. I want you to order your agent to keep his mouth closed in the future when I receive liquor."

An officer of an express company was out instructing a local agent how to handle his business. "As soon as the train

Transfers and Set-Backs for a Month.*

LOADED CARS OFFERED BY CONNECTIONS AND REJECTED, DURING NOVEMBER, 1909.

		No. of railroads from whom information was—		Number of cars rejected for different reasons. (See footnote for Key.)												Total loads rejected.
		Requested.	Received.	21	22	23	24	25	26	27	28	29	30	31	34	
1.	Buffalo	14	5	8	80	..	..	..	..	..	..	..	..	3	..	91
2.	Cincinnati	9	9	..	2	..	..	..	..	..	..	13	75	39	..	129
3.	Cleveland	7	5	58	167	..	..	1	12	2	17	70	25	100	..	452
4.	Chicago	28	22	105	61	7	16	..	..	17	15	45	32	98	24	420
5.	Denver	5	5	38	246	50	569	2	..	..	2	..	..	..	..	907
6.	Detroit	8	2	..	...	..	..	..	..	..	..	..	..	..	..	.....
7.	Indianapolis	7	3	..	3	..	1	..	..	..	..	..	..	..	..	4
8.	Kansas City	15	15	175	102	58	8	..	..	24	7	6	57	..	..	437
9.	Omaha, including Council Bluffs	10	6	170	54	..	..	..	..	1	..	11	5	..	..	241
10.	Peoria, including Pekin	14	11	54	105	..	..	..	..	..	..	..	..	..	..	159
11.	St. Louis Terminals	21	10	243	...	35	..	..	..	..	..	41	39	1	..	359
12.	Toledo	14	5	5	38	20	4	2	..	10	1	19	8	..	8	115
13.	St. Paul and Minneapolis	9	5	89	173	16	50	..	..	1	2	..	..	..	..	331
14.	Davenport, Moline & Rock Island	4	4	4	36	..	..	..	..	..	..	6	..	..	..	46
	Total	..	..	949	1,067	186	648	5	12	55	44	211	241	241	32	3,691

KEY: 21—Bad order cars (penalty defects); lading classed as transferable. 22—Bad order cars (not penalty defects); lading classed as transferable. 23—Bad order cars (penalty defects); lading classed as non-transferable. 24—Bad order cars (not penalty defects); lading classed as non-transferable. 25—Loaded in excess of clearances. 26—Loaded in excess of bridge capacities. 27—Damaged lading, including leaky tanks. 28—Improperly loaded, including overloads. 29—No billing. 30—Wrongly billed. 31—Embargoes. 34—Delivered in error.

*From a report issued March 30, by a committee of mechanical officers of lines in Chicago, for the month of November, 1909.

departs," said the officer, "first take in your money, next your small packages and last your big packages." "That's where you are mistaken," said the local agent. "Out here we must take in the liquor packages first. The gang around the depot will pay no attention to packages of money, but they will steal the liquor packages if I turn my back."—*Chicago Inter-Ocean.*

Instructing Lehigh Valley Agents.

Charles S. Lee, general passenger agent of the Lehigh Valley, proposes to put the instruction of his ticket agents on a basis where he will be able to more accurately estimate the value of the results obtained than ever before. He has instructed the district passenger agents to hold meetings for catechising the agents every month. On the Lehigh Valley, as on most railways, there are many men at the smaller stations whose duties require them to look after not only the passenger business, but also the freight, the telegraphing and the checking of baggage; and to be a general information bureau as well. As the stations are small these men cannot be paid very large salaries and in consequence they are not always so full of ambition to build up business as might be desired. A school should not only produce a better class of men to select from for higher positions, but also encourage the men to feel that the company is taking an interest in them. Then some of them will become sufficiently interested to study conditions themselves with improvement of themselves as well as increasing the business of the company.

The district passenger agent, who is supposed to be thoroughly posted, will ask each man all sorts of questions; as, for example: How many miles does the Lehigh Valley system comprise? Through what state or states does it run? What are the principal towns along its lines? Is it double-tracked all the way or only part way? Is it electrically blocked or what system is used? What are the principal trains? If a man wished to go from your station to ——— what train would be the best for him to take to reach his destination promptly? Over what line does the Lehigh Valley run through cars west of Suspension bridge and south of Bethlehem? If a man is going to Boston what would be the best way for him to go from your station and at what station in Boston would he arrive if he took your recommendation? How is checked baggage taken through Geneva for a passenger going to a local point on the New York Central?

This scheme is to be warmly commended. Not only will it mean better service to the public in every way; it will be beneficial in getting the men together so that they can meet each other personally.

French Railway Employees and Police.

The organization of railway employees in France is not always mild spoken. In the course of a demonstration at Rouen not long ago, they came into conflict with the police, and some of them were clubbed and others arrested. Thereupon a general convention of the Congress in Paris resolved to prepare for a general strike on all lines in case the Minister should not give satisfaction. The Marseilles branch moved that the organization appropriate several thousand francs for the purchase of revolvers, with which members should defend themselves against the police, but this was too much for the convention. The employees of the State Railway are said to be among the most active advocates of violent measures.

American Society for Testing Materials.

The following is the programme of the thirteenth annual meeting, to be held at Atlantic City, N. J., June 28-July 2, 1910, with headquarters at the Hotel Traymore.

FIRST SESSION, TUESDAY, JUNE 28, 3 P.M.

Minutes of the twelfth annual meeting.
Annual report of the Executive Committee
Report of Committee A-3: On Standard Specifications for Cast Iron and Finished Castings. Walter Wood, chairman.
Tests of Cast-Iron Arbitration Test Bars. C. D. Mathews.
Some Recent Tests of Cast Iron. A. E. Outerbridge, Jr.
Notes on the Annealing of Steel Castings. Albert Sauveur.
Untruly and Unevenly Chilled Car Wheels. T. D. West.
Report of Committee E-1: On Standard Methods of Testing. Gaetano Lanza, chairman.
Report of Committee B-1: On Standard Specifications for Hard-Drawn Copper Wire. J. A. Capp, chairman.
The Forest Products Laboratory; Its Purpose and Work. McGarvey Cline.
Election of Officers.
Miscellaneous Business.

SECOND SESSION, TUESDAY, JUNE 28, 8 P.M.

The Closing of Blowholes in Steel Ingots. Henry M. Howe.
Measured Strains in a Steam Boiler under Hydraulic Tests. James E. Howard.
Copper-Clad Steel; Its Metallurgy and Properties. Wirt Tassin.
Tests on Steel and Wrought-Iron Beams. H. F. Moore.
Strength of Steel from I-Beams. E. L. Hancock.

THIRD SESSION, WEDNESDAY, JUNE 29, 10 A.M.

On Steel.

Report of Committee A-1: On Standard Specifications for Steel. William R. Webster, chairman
Low-Carbon Streaks in Open-Hearth Rails. M. H. Wickhorst.
Elongation and Ductility Tests in Rail Sections under the Manufacturers' Standard Drop-Testing Machine. P. H. Dudley.
The Influence of Titanium on Segregation in Bessemer-Rail Steel. G. B. Waterhouse.
Cupro-Nickel Steel. G. H. Clamer
Test of a Structural Steel Plate Partly Fused by Short-Circuited Electric Current. A. W. Carpenter.
Report of Committee A-8: On Standard Specifications for Cold-Drawn Steel. C. E. Skinner, chairman.
Further Notes on the Heat Treatment of Steel. William Campbell.

The afternoon of Wednesday, June 29, will be reserved for sea-bathing, sailing, fishing, golf and general recreation.

MEMORIAL SESSION.

The memorial session, in honor of the memory of Dr. Charles B. Dudley, late president of the International Association for Testing Materials and of the American Society for Testing Materials, will be held on Wednesday, June 29, 8 p.m.

FIFTH SESSION, THURSDAY, JUNE 30, 10 A.M.

On Cement and Concrete.

Report of Committee C-1: On Standard Specifications for Cement. George F. Swain, chairman.
Aluminates: Their Properties and Possibilities in Cement Manufacture. Henry S. Spackman.
The Effect of Sodium Silicate Mixed With or Applied to Concrete. Albert Moyer.
Comparative Tests of Lime Mortar Both in Tension and Compression; Hydrated Lime and Sand, Lump Lime and Sand, and Cement, Lime and Sand. E. W. Lazell.
Tests on Reinforced Concrete Columns Subjected to Repeated and Eccentric Loads. M. O. Withey
The Distribution of Stress in Reinforced Concrete Beams, Including a Comparative Study of Plain Concrete in Tension and Compression. A. T. Goldbeck.
A Sand Specification and Its Specific Application. W. A. Aiken.

SIXTH SESSION, THURSDAY, JUNE 30, 3 P.M.

On Preservation Coatings and Oils.

Report of Committee D-1: On Preservation Coatings for Structural Materials. S. S. Voorhees, chairman.
Report of Committee A-5: On the Corrosion of Iron and Steel. A. S. Cushman, chairman.
A Method for Testing the Protective Power of Paints when Applied to Iron and Steel. W. H. Walker and M. T. Jones, Jr.
Another Solubility Test on Protective Coatings. G. W. Thompson.
Vermillion Paint for Railway Signals—Results of an Investigation. Robert Job.
The Painting of Cement and Concrete Structures. Charles MacNichol.
Classification of Fine Particles According to Size. G. W. Thompson.
Report of Committee D-2: On Standard Tests for Lubricants. A. H. Gill, chairman.
Report of Committee D-3: On Standard Methods of Analysis of Fats and Oils. C. N. Forrest, chairman.

The evening of Thursday, June 30, will be reserved for an engineering smoker.

SEVENTH SESSION, FRIDAY, JULY 1, 10 A.M.

On Testing Machines and Apparatus.

The 600,000-lb. Testing Machine of the University of Wisconsin. H. F. Moore and M. O. Withey.
The Scleroscope. A. F. Shore.

This paper will be followed by a general discussion on "Tests of Metals for Hardness," to be opened by Mr. A. F. Shore, Mr. Bradley Stoughton and Mr. A. S. Sauveur.

Some Testing-Laboratory Accessories. J. Madison Porter.

Brinell Ball-Test Applied to Wood. W. K. Hatt.

Apparatus for Repeated Loads on Concrete Cylinders and a Typical Result. H. C. Berry.

An Autographic Rubber-Testing Machine. T. Y. Olsen.

The Work of the Structural Materials Testing Laboratory during the Past Year. R. L. Humphrey.

An exhibit of photographs and drawings of testing apparatus, contributed by the Testing Laboratory of the Engineering College of the University of Wisconsin, will be displayed at this session.

EIGHTH SESSION, FRIDAY, JULY 1, 3 P.M.

The Deterioration of Soluble Bitumen. Prévost Hubbard and C. S. Reeve.

The discussion of this paper will be opened by Mr. S. R. Church, Mr. A. W. Dow, Mr. W. H. Fulweiler, Mr. Clifford Richardson and Mr. Albert Summer.

Improved Instruments for the Physical Testing of Bituminous Materials. Herbert Abraham.

Necessary Reforms in Specifications for Petroleum Products. Albert Sommer.

A New Machine for Testing Pitch. T. Y. Olsen.

Report of Committee D-8: On Waterproofing Materials. W. A. Aiken, chairman.

Report of Committee D-9: On Standard Tests of Insulating Materials. C. E. Skinner, chairman.

Report of Committee D-5: On Standard Specifications for Coal. J. A. Holmes, chairman.

Fuel Investigations, U. S. Geological Survey; Progress During the Year Ending June 30, 1910. J. A. Holmes.

The evening of Friday, July 1, will be reserved for recreation.

NINTH SESSION, SATURDAY, JULY 2, 10 A.M.

Report of Committee C-3: On Standard Specifications for Paving and Building Brick. L. W. Page, chairman.

Report of Committee D-4: On Standard Tests for Road Materials. L. W. Page, chairman.

Report of Committee C-4: On Standard Specifications for Vitrified Clay and Cement Sewer Pipe. Rudolph Hering, chairman.

Report of Committee D-7: On Standard Specifications for the Grading of Structural Timber. H. von Schrenk, chairman.

Report of Committee A-6: On the Magnetic Testing of Iron and Steel. J. W. Esterline, chairman.

A Comparison of Magnetic Permeameters. Charles W. Burrows.

The Exponential Law of Endurance Tests. O. H. Basquin.

Miscellaneous Business.

Machine Tool Builders' Convention.

The National Machine Tool Builders' Association held its semi-annual convention at Rochester, New York, May 24 and 25. The committee on the "Standardization of Motors" reported considerable progress in securing the co-operation of the motor builders. Fred L. Eberhardt described the apprenticeship system in force at the Gould & Eberhardt works in Newark, N. J. The apprentices are bound and indentured according to the apprenticeship laws of New Jersey. The parents of the apprentices must pay $1 per week for about three-fourths of the four-year course; this amount forms the collateral for a bond which the father or guardian is required to execute. If the apprentice completes his term satisfactorily the money is returned, but if not, it is forfeited.

J. B. Doan, of the American Tool Works Company, discussed such phases of the tariff question as are of interest to the machine tool builders. Prof. F. B. Dyer, superintendent of the Cincinnati schools, described the work which is being done by the continuation schools. This scheme undoubtedly marks one of the most important advances in industrial education and was outlined in a general way in Prof. Schneider's address before the International Railway General Foremen's Association as reported in the *Railway Age Gazette* of May 6, page 1170. William Lodge and R. K. Le Blond discussed the advantages and disadvantages of the cone and gear drives. The cost of maintenance and the relative efficiency of these two types should be studied carefully by the prospective purchaser. A resolution was adopted urging Congress to pass a bill for the creation of a patent court of appeal. A. H. Hitchcock, of *Hitchcock's List*, and John A. Hill, of the *American Machinist*, spoke on "Direct Advertising vs. Trade Paper Advertising."

Railway Policemen.

The Railway Association of Special Agents and Police of the United States and Canada (which will be known henceforth by another name) held its annual meeting at Los Angeles, Cal., May 10, 11, 12 and 13. It was the fourteenth annual convention. The following officers were elected for the ensuing year: President, H. H. Germain (A., T. & S. F.), Topeka, Kan., re-elected; first vice-president, J. J. Landers (N. Y. C. & H. R.; second vice-president, P. J. Kindelon (S. P.); third vice-president, F. H. Schlapbach (C. of Ga.); secretary, W. C. Pannell, inspector, Southern Railway and Chesapeake Steamship Co., Baltimore Md., re-elected.

The convention changed the name from that given above to the "International Association of Railway Special Agents and Police."

It was decided to publish a quarterly journal to be called "The Railway Special Agent and Police," as an official journal of the association, in order to bring the different members in closer touch with each other. The first issue will appear in July.

The next annual convention is to be held in Chattanooga, Tenn., in April or May, 1911.

Among the subjects discussed at the meeting were proper and improper methods of securing confessions from prisoners; trade marks; disposition of journal bearings; organization of a railway police department, and advantages of automatic car seals. The members enjoyed numerous excursions and other entertainments provided for them by the railways of southern California and by the citizens of Los Angeles. The association now has 318 members, representing 79 railways, covering 162,000 miles of line.

American Society of Civil Engineers.

At the regular meeting held on June 1, two papers describing the New York tunnel extension of the Pennsylvania Railroad, entitled "The Meadows Division and Harrison Transfer Yard," by E. B. Temple, M. Am. Soc. C. E., and "The North River Tunnels," by B. H. Hewitt and W. L. Brown, Members, Am. Soc. C. E., were presented. These papers were published in the April proceedings.

New York Railroad Club.

To accommodate those going to the annual conventions of the M. C. B. and A. R. M. M. Associations at Atlantic City, N. J., the Central Railroad of New Jersey will run a special train of Pullman parlor cars, leaving New York city, foot of West Twenty-third street, at 3:20 p. m., and foot of Liberty street at 3:40 p. m. on Tuesday, June 14.

Railway Mail Clerks' Association.

At its annual convention at Kansas City, Mo., on May 24, the Railway Mail Clerks' Association of America adopted a resolution asking the government to prohibit railways from using wood mail cars between locomotives and steel cars, or between steel cars.

Yardmasters.

The second annual inspection trip of the General Yardmasters' Association will be run out of Indianapolis June 7. Yardmasters from other cities, including Chicago, Cincinnati and Louisville, have been invited to make the trip over local lines, visiting yards, warehouses and points of interest in the vicinity of Indianapolis.

The Traffic Club of New York.

At the regular monthly meeting held at the Hotel Astor on May 31, Welding Ring, president of the New York Produce Exchange, addressed the club on the subject: "Waterways and Waterborne Traffic and Subsidies as Affecting Shipping."

MEETINGS AND CONVENTIONS.

The following list gives names of secretaries, dates of next or regular meetings, and places of meeting

Air Brake Association.—F. M. Nellis, 53 State St., Boston, Mass.
American Association of Demurrage Officers.—A. G. Thomason, Scranton, Pa.; June 17; Omaha, Neb.
American Association of General Passenger and Ticket Agents.—C. M. Burt, Boston, Mass.; next meeting, St. Paul, Minn.
American Assoc. of Local Freight Agents' Ass'ns.—G. W. Dennison, Penna. Co., Toledo, Ohio.
American Ass'n of Railroad Superintendents.—O. G. Fetter, Carew Bldg., Cincinnati, Ohio; during first week in month.
American Railway Association.—W. F. Allen, 24 Park Place, New York.
American Railway Bridge and Building Association.—C. A. Lichty, C. & N. W., Chicago; Oct. 18; Fort Worth, Tex.
American Railway Engineering and Maint. of Way Assoc.—E. H. Fritch, Monadnock Bldg., Chicago.
American Railway Industrial Association.—G. L. Stewart, St. L. S. W. Ry., St. Louis; second Tuesday, May; Memphis, Tenn.
American Railway Master Mechanics' Association.—J. W. Taylor, Old Colony Building, Chicago; June 20-22: Atlantic City
American Railway Tool Foremen's Association.—O. T. Harroun, Bloomington, Ill.; July 12; Chicago.
American Society for Testing Materials.—Prof. Edgar Marburg, Univ. of Pa., Philadelphia; June 28-July 2; Atlantic City.
American Society of Civil Engineers.—C. W. Hunt, 220 W. 57th St., N. Y.; 1st and 3d Wed., except July and August; New York.
American Society of Mechanical Engineers.—Calvin W. Rice, 29 W. 29th St., N. Y.; 2d Tues; N. Y.; May 31-June 3; Atlantic City.
American Street and Interurban Railway Association.—H. C. Donecker, 29 W. 39th St., New York.
Association of Am. Ry. Accounting Officers.—C. G. Phillips, 143 Dearborn St., Chicago; June 29, 1910; Colorado Springs.
Association of Railway Claim Agents.—E. H. Hemus, A., T. & S. F., Topeka, Kan
Association of Railway Telegraph Superintendents.—P. W. Drew, Wis. Central Ry., Chicago; June 20-24, 1910; Los Angeles.;
Association of Transportation and Car Accounting Officers.—G. P. Conard, 24 Park Pl., N. Y.; June 21-22; Colorado Springs.
Buffalo Transportation Club.—J. N. Sells, Buffalo.
Canadian Railway Club.—James Powell, Grand Trunk Ry., Montreal, Que.; 1st Tues. in month, except June, July and Aug.; Montreal.
Canadian Society of Civil Engineers.—Clement H. McLeod, Montreal, Que.: Thursdays; Montreal.
Car Foreman's Association of Chicago.—Aaron Kline, 841 North 50th Court, Chicago; 2d Monday in month; Chicago.
Central Railway Club.—H. D. Vought, 95 Liberty St., New York; 2d Friday in January, March, May, Sept. and Nov.; Buffalo.
Engineers' Society of Pennsylvania.—E. R. Dasher, Box 704, Harrisburg, Pa.; June 1-4; Harrisburg.
Engineers' Society of Western Pennsylvania.—E. K. Hiles, 803 Fulton Building, Pittsburgh; 1st and 3d Tuesdays; Pittsburgh.
Freight Claim Association.—Warren P. Taylor, Rich., Fred. & Pot. R. R., Richmond, Va.; June 15, 1910; California.
General Superintendents' Assoc. of Chicago.—H. D. Judson, 209 Adams St., Chicago; Wednesday preceding 3d Thurs.; Chicago.
International Master Boiler Makers' Association.—Harry D. Vought, 95 Liberty St., New York
International Railway Fuel Association.—D. B. Sebastian, La Salle St. Station, Chicago.
International Railway General Foremen's Association.—L. H. Bryan, D. & I. R. Ry., Two Harbors, Minn.
International Railway Master Blacksmiths' Ass'n.—A. L. Woodworth, Lima, Ohio; Aug. 16-18; Detroit. Mich.
International Railway Congress.—Executive Committee, rue de Louvain, 11, Brussels; July 4-16; Berne, Switzerland.
Iowa Railway Club.—W. B. Harrison, Union Station, Des Moines, Ia.; 2d Friday in month, except July and August; Des Moines.
Master Car Builders' Association.—J. W. Taylor, Old Colony Bldg., Chicago; June 15-17; Atlantic City.
New England Railroad Club.—G. H. Frazier, 10 Oliver St., Boston, Mass.; 2d Tues. in month, ex. June, July, Aug. and Sept.; Boston.
New York Railroad Club.—H. D. Vought, 95 Liberty St., New York; 3d Friday in month, except June, July and August; New York.
North-West Railway Club.—T. W. Flanagan, Soo Line, Minn.; 1st Tues. after 2d Mon., ex. June, July, August; St. Paul and Minn.
Omaha Railway Club.—A. H. Christiansen, Barker Blk.; 2d Wed.
Northern Railway Club.—C. L. Kennedy, C., M. & St. P., Duluth; 4th Saturday; Duluth, Minn.
Railroad Club of Kansas City.—Third Friday in month; Kansas City.
Railway Association of Special Agents and Police of U. S. and Canada.—W. C. Pannell, Sec'y-Treas., Sou. Ry., Baltimore, Md.
Railroad Club of Kansas City.—C. Manlove, 1008 Walnut St., Kansas City; Third Friday in month; Kansas City.
Railway Signal Association.—C. C. Rosenberg, 12 North Linden St., Bethlehem, Pa.; regular meeting, June 14; New York.
Railway Storekeepers' Association.—J. P. Murphy, Box C., Collinwood, Ohio.
Richmond Railroad Club.—F. O. Robinson; 2d Monday; Richmond.
Roadmasters' and Maintenance of Way Association.—Walter E. Emery, P. & P. U. Ry., Peoria, Ill.
St. Louis Railway Club.—B. W. Frauenthal, Union Station, St. Louis, Mo.; 2d Friday in month, except June, July and Aug.; St. Louis.
Society of Ry. Financial Officers.—C. Nyquist, La Salle St. Sta., Chicago.
Southern Association of Car Service Officers.—E. W. Sandwich, A. & W. R. Ry., Montgomery, Ala.; annual, Oct. 20; Atlanta.
Southern & Southwestern R.R. Club.—A. J. Merrill, Prudential Bldg., Atlanta; 3d Thurs., Jan., Mar., July, Sept. and Nov.; Atlanta.
Traffic Club of New York.—C. A. Swope, 290 Broadway, New York; last Tuesday in month, except June, July and August; New York.
Train Despatchers' Assoc. of America.—J. F. Mackie, 7042 Stewart Ave., Chicago; June 21; Spokane, Wash.
Transportation Club of Toledo.—L. G. Macomber, Woolsen Spice Co., Toledo.
Traveling Engineers' Association.—W. O. Thompson, N. Y. C. & H. R., East Buffalo; annual meeting, Aug. 16-19; Niagara Falls, Ont.
Western Canada Railway Club.—W. H. Rosevear, P. O. Box 1707, Winnipeg; 2d Monday, except June, July and August; Winnipeg.
Western Society of Engineers.—J. H. Warder, Monadnock Bldg., Chicago; Wednesdays, except July and August; Chicago.

Traffic News.

The earnings of the Indiana railways are being greatly benefited by labor troubles in the Illinois coal fields. The Indiana coal is given practically a free hand to the northwest market and the lake docks. Coal is selling at the Indiana mines for $1 a ton above the normal price.

Following a conference with the Nevada State Railroad Commission, the Nevada Northern Railroad has announced reductions of 22½ per cent. in its freight tariffs; and this will apply to interstate as well as intra-state rates. The commission had threatened to order reduction of 30 per cent.

The Los Angeles Limited, which was formerly run from Chicago to Los Angeles over the Chicago & Northwestern, the Union Pacific and the San Pedro, Los Angeles & Salt Lake, and which was taken off when a large part of the track of the Salt Lake road was washed away by floods last January, will be put on again on Sunday, June 12. Its schedule time between Chicago and Los Angeles will be 68½ hours.

The Southern Railway is preparing to resume the running of special peach trains from Atlanta to northern cities, running the trains as sections of the fast mail No. 36, and bringing the peaches into New York and the other principal cities on the second morning. Peaches shipped from points around Atlanta reach that city in time to start northward about midnight of the same day, close behind No. 36. At a recent conference with the peach growers the company asked for suggestions as to improvements, but was told that all the shippers asked was to have the good service of last year repeated. In that year the Southern Railway carried 84 per cent. of the peaches from Georgia and had only one claim for damages on this freight. It is estimated that shipments this year will be two or three times as great as last year.

The increase in rates on coal in Illinois which the railways had announced would be made on June 1, has been suspended pending an investigation by the Illinois Railway Commission of its reasonableness. Chairman Berry interrupted the hearing on May 24 to say that the investigation would be interminable if the commission allowed both sides to continue to introduce statistics regarding tariffs, earnings, etc., and suggested that both the railways and the shippers submit to the commission all the statistics and documentary evidence that they desire to; indicating that the commission would then turn the data over to its experts with the object of finding out just what the true situation is. He said the first purpose of the commission was to find out just what is the financial status of the railways involved. He suggested that if the railways did not care to agree to a suspension of rates, the commission had the power to make the present rates the maximum rates. This hint was effective. The Indiana Manufacturers' and Shippers' Association has filed a complaint with the Indiana commission against advances in rates from Indiana points similar to those which are being made from Illinois mines.

Judges Grosscup, Seaman and Baker of the United States circuit court heard arguments at Chicago on May 25 on the petition of the Pullman Company for an injunction to restrain the Interstate Commerce Commission from reducing the rates of this company between Chicago and St. Paul, St. Paul and Seattle and other cities. The Chicago, Milwaukee & St. Paul, the Great Northern and the Santa Fe filed petitions to be allowed to intervene as co-complainants against the commission. George B. Fernald, general attorney of the Pullman Company, contended in his argument that this company is not a common carrier but more in the nature of a hotel company, and that therefore its rates are not subject to public regulation. An affidavit of Robert T. Lincoln, president of the company, was filed, stating that if the rates fixed by the commission were put into effect they would, because of competition, compel a reduction in all sleeping car rates west of the Missouri river. Burton Hanson, general solicitor of the St. Paul, in his petition stated that this road is now operating sleeping cars between Chicago, St. Paul, Butte, Mont., and other points, and by August 1 expects to be operating them to Tacoma and Seattle, and that if the Pullman Company makes a reduction, the St. Paul will be compelled to make corresponding reductions.

REVENUES AND EXPENSES OF RAILWAYS.

MONTH OF MARCH, 1910.
(See also issues of May 6, 13, 20, and 27.)

Name of road.	Mileage operated at end of period.	Operating revenues			Operating expenses						Net operating revenues (or deficit).	Outside operations. net.	Taxes.	Operating income (or loss).	Increase (or dec.) comp. with last year.
		Freight.	Passenger.	Total, inc. misc.	Maintenance Way and structures.	Maintenance Of equipment.	Traffic.	Transportation.	General.	Total.					
Atlanta & West Point	93	$54,826	$32,872	$96,417	$13,322	$17,627	$4,460	$31,955	$3,605	$70,969	$25,448	$239	$4,331	$21,356	$11,063
Atlantic City	166	62,668	48,878	116,128	25,404	21,323	1,991	61,298	704	110,720	5,408	—2,933	7,000	—4,525	—13,272
Belt Ry. of Chicago	21	.....	.....	181,027	10,804	22,714	506	101,019	6,194	141,237	39,790	.....	5,000	34,790	—32,898
Butte, Anaconda & Pacific	46	92,161	5,800	104,189	11,665	21,624	576	42,879	2,978	79,723	24,466	.....	2,000	22,466	—12,632
Chicago Terminal Transfer	90	.....	2,861	126,547	13,992	24,280	323	73,108	4,885	116,588	9,959	638	18,558	—7,961	607
Cincinnati & Muskingum Valley	148	71,727	17,815	94,644	13,132	12,073	1,754	30,539	2,022	59,520	35,124	.....	3,110	32,014	16,080
Cleveland, Akron & Columbus	212	164,678	36,794	215,059	34,312	43,883	2,450	73,582	3,247	157,474	57,585	.....	5,000	52,585	16,649
Cleveland Terminal & Valley	93	80,225	16,799	122,802	14,375	14,063	1,508	41,015	1,568	72,529	50,273	.....	3,404	46,869	30,534
Duluth & Iron Range	168	91,779	27,340	125,661	61,671	47,974	395	61,800	8,103	179,943	—54,282	—4,427	5,098	—63,807	—29,892
Duluth, South Shore & Atlantic	613	194,525	69,276	276,893	34,650	28,424	8,083	97,700	6,190	175,047	101,846	6	18,000	83,852	37,620
Eastern Ry. Co. of New Mexico	227	47,827	30,498	83,855	19,824	10,290	1,179	24,490	2,184	57,967	25,888	.....	3,930	21,958	—5,568
Evansville & Terre Haute	310	156,930	50,483	228,671	26,627	32,559	4,812	66,995	5,813	136,806	91,865	—759	10,023	81,083	22,820
Houston, East & West Texas	191	76,390	25,490	108,084	13,529	11,530	1,056	37,762	3,477	67,355	40,729	.....	3,079	37,650	6,211
Indiana Harbor Belt	106	.....	.....	224,887	13,437	24,808	1,994	122,469	5,639	168,348	56,540	1,490	5,500	52,530	54,990
Lehigh & Hudson River	97	107,697	3,404	112,217	10,484	16,437	1,301	39,572	3,259	71,053	41,163	.....	2,750	38,413	9,555
Monongahela	65	140,091	2,624	143,937	18,273	9,107	200	29,720	1,924	59,224	84,713	.....	1,200	83,513	40,993
Nevada Northern	165	122,468	13,627	140,460	8,457	12,097	331	27,604	3,688	52,177	88,283	.....	3,365	84,917	24,540
New York, Philadelphia & Norfolk	112	218,842	30,322	264,773	35,388	43,522	2,719	95,311	12,288	189,228	75,545	.....	6,850	68,695	7,482
Pecos & Northern Texas	198*	118,513	21,692	146,281	20,222	27,849	2,227	50,807	3,935	105,040	41,241	.....	2,097	39,144	13,654
Port Reading	21	101,953	.....	102,857	8,332	3,643	30	24,793	92	36,890	65,967	3,967	3,000	66,934	—34,755
Richmond, Fredericksburg & Potomac	83	113,740	85,835	220,938	31,477	19,700	2,089	64,425	5,299	122,990	97,948	.....	200	97,748	31,549
St. Louis, Brownsville & Mexico	494†	98,849	47,183	156,813	43,639	12,740	2,405	54,682	6,590	120,056	36,757	.....	3,500	33,257	—13,825
St. Louis, Merchants' Br. Terminal	9	.....	6,735	194,880	22,346	5,160	341	73,898	6,029	107,775	87,105	.....	9,700	77,405	40,085
San Antonio & Aransas Pass	727	205,628	74,751	297,827	59,441	50,027	4,698	120,338	8,768	243,272	54,555	.....	9,000	45,555	4,159
San Pedro, Los Angeles & Salt Lake	979‡	202,365	72,090	289,401	181,703	70,555	17,558	137,441	15,261	422,518	—133,117	843	22,432	—154,706	—357,168
Southern Kansas Ry. of Texas	125	114,271	19,127	137,903	17,654	29,936	2,149	44,755	3,946	98,440	39,463	.....	2,325	37,138	14,115
Spokane & Inland Empire	168	32,570	37,062	72,912	28,645	4,572	1,193	25,155	5,881	65,446	7,466	9,801	3,300	13,967	—9,243
Spokane International	141	66,119	20,874	89,422	15,329	7,024	2,084	27,476	3,283	55,196	34,226	.....	4,458	29,768	15,114
Terminal R.R. Ass'n of St. Louis	34	.....	248	251,192	23,091	30,198	512	91,643	6,812	152,257	98,935	17,429	40,366	75,998	—1,165
Texas Central	268	48,206	23,492	79,404	13,554	14,139	1,375	26,643	3,570	59,281	20,123	.....	2,137	17,986	11,212
Ulster & Delaware	129	47,110	14,926	66,246	7,545	13,103	898	32,735	2,382	56,663	9,583	18	3,200	6,401	—17,410
Union R.R. Co. of Baltimore	9	96,865	19,267	117,587	9,632	.....	876	4,921	1,803	17,232	100,356	.....	4,465	95,890	12,260
Union R.R. Co. (of Pennsylvania)	31	.....	.....	269,022	22,545	54,812	120	110,854	3,270	191,601	77,421	5,345	2,500	80,266	99,474
Virginia & Southwestern	188	93,998	11,017	107,734	12,415	23,455	1,338	33,074	3,239	73,521	34,213	.....	5,209	29,004	10,414
Washington Southern	35	35,483	39,459	96,619	10,083	7,943	954	37,207	2,191	58,378	38,241	.....	2,345	35,896	5,997
Western Ry. of Alabama	133	68,822	31,816	109,797	21,221	17,518	4,856	27,946	4,795	76,336	33,461	—161	3,812	29,488	13,548
NINE MONTHS OF FISCAL YEAR, 1910.															
Atlanta & West Point	93	$432,325	$324,347	$827,863	$102,742	$146,625	$43,421	$260,438	$36,131	$579,357	$248,506	$538	$38,982	$210,062	$83,127
Atlantic City	166	532,465	768,776	1,360,300	230,660	140,040	20,628	646,442	9,871	1,047,641	312,659	—31,696	63,000	217,963	70,505
Belt Ry. of Chicago	21	.....	.....	1,550,975	118,511	215,344	5,138	729,357	55,903	1,124,253	426,722	.....	45,000	381,722	174,330
Butte, Anaconda & Pacific	46	795,014	74,015	920,708	87,302	181,642	4,982	376,169	19,215	669,310	251,398	.....	18,918	232,480	—62,844
Chicago Terminal Transfer	90	.....	22,100	949,602	132,027	226,867	4,703	476,098	44,852	884,547	65,055	7,024	145,998	—73,918	—3,834
Cincinnati & Muskingum Valley	148	568,222	168,522	783,623	142,944	106,826	15,847	264,983	13,165	543,765	239,858	.....	28,318	211,540	89,125
Cleveland, Akron & Columbus	212	1,358,743	381,024	1,861,474	277,341	447,217	24,972	597,056	33,743	1,380,329	481,145	.....	46,042	435,103	—2,470
Cleveland Terminal & Valley	93	652,642	136,015	960,736	124,427	114,591	14,108	380,298	18,818	652,242	308,494	.....	30,628	277,866	77,936
Duluth & Iron Range	168	6,536,852	203,375	6,809,623	780,080	498,963	3,187	1,158,818	95,295	2,536,343	4,273,280	9,245	322,378	3,960,147	1,165,951
Duluth, South Shore & Atlantic	613	1,562,262	729,683	2,421,665	359,192	261,134	80,482	887,903	60,219	1,648,930	772,735	6,388	170,146	608,977	215,475
Eastern Ry. Co. of New Mexico	227	392,017	298,710	733,177	167,427	95,047	9,109	195,539	21,731	488,853	244,324	.....	32,467	211,857	—53,225
Evansville & Terre Haute	310	1,236,051	467,460	1,883,619	215,716	281,363	45,835	555,574	58,736	1,157,224	726,395	—7,950	81,325	637,120	137,695
Houston, East & West Texas	191	673,336	247,762	974,336	171,483	76,469	15,713	325,911	30,508	620,084	354,252	.....	19,701	334,551	37,240
Indiana Harbor Belt	106	.....	.....	1,586,609	256,736	182,414	15,465	840,875	43,135	1,338,625	247,984	—6,377	38,959	202,648	173,148
Lehigh & Hudson River	97	1,009,750	33,619	1,056,338	137,255	118,026	10,747	374,948	33,766	674,742	381,596	.....	24,675	356,921	151,334
Monongahela	65	1,074,435	20,870	1,108,301	133,542	84,411	2,283	230,953	15,398	466,587	641,714	.....	10,600	631,114	265,881
Nevada Northern	165	928,303	130,667	1,095,403	57,620	102,292	3,014	224,656	32,218	419,800	675,604	.....	27,502	648,102	188,087
New York, Philadelphia & Norfolk	112	1,944,341	295,835	2,399,708	247,189	405,155	30,610	853,485	83,532	1,619,972	779,736	.....	58,050	721,686	151,060
Pecos & Northern Texas	198*	958,653	198,815	1,204,430	191,235	175,419	16,960	353,753	35,919	773,286	431,144	.....	16,773	414,371	107,688
Port Reading	21	855,269	.....	864,260	69,721	4,922	270	228,214	1,020	304,147	560,113	34,062	27,000	567,175	—67,780
Richmond, Fredericksburg & Potomac	83	859,979	569,559	1,616,215	242,868	199,235	21,762	529,185	43,264	1,036,318	579,897	.....	1,800	578,097	117,778
St. Louis, Brownsville & Mexico	494†	709,850	358,461	1,140,604	305,147	95,231	22,732	395,623	59,377	878,110	262,494	.....	29,500	232,994	33,768
St. Louis, Merchants' Br. Terminal	9	.....	50,218	1,402,922	200,277	36,321	5,530	540,636	46,369	829,133	573,789	.....	57,645	516,144	184,428
San Antonio & Aransas Pass	727	2,104,899	769,103	3,037,818	475,355	390,624	41,045	1,123,864	79,866	2,110,754	927,064	.....	81,000	846,064	—6,621
San Pedro, Los Angeles & Salt Lake	979‡	2,835,895	1,836,598	5,004,504	1,016,608	857,898	224,963	1,706,945	146,508	3,952,922	1,051,582	—15,688	217,226	818,668	—584,912
Southern Kansas Ry. of Texas	125	956,683	176,633	1,165,501	144,546	204,723	17,495	375,414	33,310	775,488	390,013	.....	17,802	372,211	198,534
Spokane & Inland Empire	168	347,212	541,095	935,640	125,142	52,029	17,169	249,598	61,339	505,278	430,363	116,968	26,100	521,231	258,341
Spokane International	141	531,623	185,506	736,862	93,665	43,102	17,267	235,513	42,578	432,125	304,737	.....	24,595	280,142	130,111
Terminal R.R. Ass'n of St. Louis	34	.....	2,263	2,060,313	273,363	156,655	7,937	691,962	54,909	1,184,825	875,488	135,455	254,611	756,332	—43,906
Texas Central	268	490,622	271,444	826,298	141,848	114,836	14,021	252,416	33,916	557,037	269,261	.....	24,526	244,735	—41,278
Ulster & Delaware	129	483,778	277,099	798,494	97,407	107,737	10,607	322,688	22,212	560,651	237,843	1,026	28,800	210,069	10,196
Union R.R. Co. of Baltimore	9	885,520	172,150	1,072,694	99,463	5,510	.....	49,904	16,816	166,693	906,001	.....	40,188	865,813	188,964
Union R.R. Co. (of Pennsylvania)	31	.....	.....	2,964,631	261,725	466,766	1,010	983,616	31,828	1,744,945	1,219,686	41,999	28,842	1,232,844	684,572
Virginia & Southwestern	188	786,380	103,666	918,871	124,541	190,024	12,420	273,399	30,188	630,572	288,299	.....	39,528	248,771	—32,520
Washington Southern	35	286,046	279,407	745,589	70,322	77,388	9,685	275,256	19,393	452,044	293,545	.....	21,104	272,442	42,766
Western Ry. of Alabama	133	509,923	317,477	897,257	150,591	155,951	46,943	235,736	44,378	633,599	263,658	—3,061	34,310	226,286	45,772

*Mileage operated March 31, 1909, 152 miles. †Mileage operated March 31, 1909, 454 miles. ‡Total mileage 1,099 on March 31, 1909; 126 miles not operated during March, 1910, on account of washout. — Indicates Deficits, Losses and Decreases.

Further Increases in Suburban Fares.

The New York Central & Hudson River has issued revised tariffs of suburban passenger fares to and from New York City, to go into effect July 1. The new rates are calculated on about the same basis as those of the New York, New Haven & Hartford, heretofore announced, but the increases in some cases are less because the present rates on the Central are not so low as those of the New Haven. Following are sample rates for 60 rides a month:

	Miles from New York.	Fare—Present.	Fare—New.
Yonkers	15	$5.90	$6.75
Tarrytown	25	7.60	8.25
Peekskill	41	10.30	11.05
Mount Vernon.	14	5.60	6.50
White Plains	23	7.35	8.10

Fifty-trip family tickets are to be advanced June 25 by about the same percentage as the monthly tickets.

The New York State Public Service Commission, second district, after hearing complaints from people in Mount Vernon and New Rochelle, N. Y., finds that the New York, New Haven & Hartford has not posted its increased rates on season tickets to and from New York City, and that, therefore, the advances cannot go into effect June 1, as announced by the company. It appears that the New Haven road with these tariffs pursued the same course that has been common with interstate tariffs; the tariffs are kept in the ticket office and a notice is posted in the public rooms giving the information that the tariffs may be seen by anyone on application to the agent.

The Erie has filed with the Interstate Commerce Commission its increased fares for season tickets, to take effect July 1. The new rates are calculated on the following basis: Sixty rides a month, not over eight miles, one cent a mile; for nine miles, 4 per cent. less; for 10 miles another 4 per cent. is deducted, and so on up to 30 miles, for which distance the rate is five mills a mile. The minimum price of a monthly ticket (60 trips) is $5.50. Ten-trip tickets are sold at two cents a mile and 50-trip family tickets, good for one year, at 1.6 cents per mile. Following are sample fares:

	Miles from New York.	Fare—Present.	Fare—New.
Paterson	21	$5.80	$6.95
Suffern	32	8.00	9.55
Newark	9	4.60	5.50
Nutley	14	5.50	6.20
Montclair	13	5.50	6.35

The Delaware, Lackawanna & Western announces increases in suburban season-ticket fares to and from New York similar to those which have already been announced by the New York Central, the New Haven and the Erie. The new Lackawanna tariffs go into effect June 28. Following are a few typical items:

	Miles from New York.	Fare—Present.	Fare—New.
Newark	9	$4.60	$5.50
Orange	13	5.50	6.20
Summit	21	6.45	7.65
Bloomfield	13	5.50	6.05
Montclair	15	5.50	6.35

The Lehigh Valley has followed the lead of the other roads running into New York and has filed with the Interstate Commerce Commission new tariffs showing increases in commutation rates on just about the same scale as the increase on the Central of New Jersey.

Distance Rates in Iowa.

Clifford Thorne, a candidate for the Republican nomination for membership on the Railway Commission of Iowa, recently made a speech in which he called attention to the fact that the growth of manufactories in Iowa has been slower than in surrounding states. Every state adjoining Iowa, except Nebraska and South Dakota, he said, has a larger output of manufactured products than Iowa. The volume of manufactured products of Minnesota is almost double that of Iowa; of Missouri, two and a half times as large; of Illinois, nine times as large. Mr. Thorne contended that the reason for the backward development of manufacturing industries in Iowa is that that state enjoys less favorable interstate freight rates than other states, and he demanded that an exhaustive investigation of these rates be made by the state commission. Railway men who are familiar with the freight rates of Iowa say that Mr. Thorne is "barking up the wrong tree." The real drawback to manufacturing industries in Iowa is the system of state rates prescribed by law and by the railway commission, which are based more completely on distance than the rates in any other state. In no other state is the long and short haul principle so rigorously enforced, the consequence of which is that between many points the railways having the long lines do not meet the competition of the railway having the short line. The distance tariffs prescribed by the Iowa commission give shippers in that state low rates for short hauls and relatively high rates for long hauls, the effect being that the market of the manufacturers of the state is rigorously limited. The consequence is that manufacturers in other states can undersell the manufacturers of Iowa at all points to which goods have to be shipped from any considerable distance. Railway traffic men say that so long as it is the policy of the government of Iowa to keep rates on approximately a mileage basis it will be impossible for the people of that state to develop any considerable manufacturing industry.

INTERSTATE COMMERCE COMMISSION.

Definition of Carload Shipment.

Sunderland Brothers Co. v. Missouri, Kansas & Texas et al. Opinion by Commissioner Harlan.

When a car is demanded and loaded by the shipper and is handled as a carload and no minimum carload weight is legally provided, the carload rate, if less than the L.C.L. rate, must be applied on the actual weight. This ruling does not in any way limit the right of railways to fix a minimum carload weight. (18 I. C. C., 425.)

Discrimination Against Red Wing, Minn.

Frederich & Kempe Co. et al. v. New York, New Haven & Hartford et al. Opinion by Chairman Knapp.

Red Wing, Minn., lies intermediate between trunk line territory and St. Paul, Minn. It also lies nearer trunk line territory than other points to which rates from trunk line territory are the same as they are to St. Paul. Red Wing, however, has higher rates from trunk line territory than has St. Paul, although it has the same rates from Central Freight Association territory. The commission finds that no point of any importance south of St. Paul takes as high rates as Red Wing, and that freight moving all rail from Central Freight Association as well as from trunk line points passes through Chicago or Milwaukee, La Crosse and Winona on its way to Red Wing, and that transportation conditions are precisely the same whether the traffic originated in trunk line of Central Freight Association territory. Rates to Red Wing from trunk line territory are therefore ordered no higher than those from trunk line territory to St. Paul. (18 I. C. C., 481.)

Misrouting by Connecting Line.

Duluth & Iron Range Railroad v. Chicago, St. Paul, Minneapolis & Omaha et al. Opinion by Commissioner Harlan.

A connecting line receiving a shipment without instructions may demand instructions from the initial carrier, but if, instead of pursuing that course, it assumes the responsibility of routing the shipment it must accept the resulting liability for any damage in the way of increased charges that necessarily and directly flows from its mistake in selecting the wrong route. It is not excused by the fact that the shipper had given correct routing instructions which the initial carrier had neglected to note on the transfer billing.

Connecting lines from the nature of their larger traffic and wider opportunities for knowing what are the reasonably direct routes ought in many cases to relieve small initial carriers of the responsibility for correct routing; and, with respect to shipments to distant and unusual points, the initial carrier, as well as its immediate connections, ought not to be held to any greater duty than that of indicating the usual or proper gateway to destination. In such cases responsi-

bility for specific routing would seem more logically to attach to the carriers beyond the gateway. (18 I. C. C., 485.)

Rate on Burnt Cotton.

Simon Lesser v. Georgia Railroad et al. Opinion by Commissioner Harlan.

The real contention of the petitioner is that the rate on mixed jute and cotton refuse or tailings should be extended to burnt cotton on the theory that burnt cotton in reality is cotton refuse. Notwithstanding the fact that the value of burnt cotton is less than that of uninjured cotton, the traffic in this damaged cotton is so small, and the difficulties of making satisfactory regulations regarding the shipment of burnt cotton and the difficulties of a clear distinction between burnt cotton and cotton so slightly injured as to have the same value as uninjured cotton is so great that no lower rate should be ordered on burnt cotton than is applied on uninjured cotton. (18 I. C. C., 479.)

STATE COMMISSIONS.

The Mississippi State Railroad Commission has adopted for use in that state the average rule for the collection of car demurrage, which is prescribed in the code of the American Railway Association and by the Interstate Commerce Commission.

The Pennsylvania State Railroad Commission has engaged Ford, Bacon & Davis, engineers, of New York City, to investigate the operation of the Philadelphia Rapid Transit Company, which works the principal surface, subway and elevated street railways in that city. The chief engineer of this firm is Charles F. Uebelacher.

The Kansas Railway Commission has ordered heavy reductions of express rates in that state. Some of the reductions ordered are as follows: 12 per cent. on all merchandise where the rate per 100 lbs. is over $1; 15½ per cent. in rates in excess of 90 cents per 100 lbs., and 52 per cent. in rates for shipments of parts of agricultural implements.

The New York Public Service Commission, Second district, has decided that the New York, New Haven & Hartford cannot on June 1 legally charge the higher commutation rates that were to become effective June 1 because the railway had neglected to file the new tariffs in certain stations on its lines 30 days before the effective date of these tariffs. The new tariffs had been filed with the state commission 30 days before June 1.

The Indiana Railroad Commission has heard and taken under advisement an application from the Lake Shore & Michigan Southern asking to be relieved from a recent order of the commission ordering block signals on a subsidiary line running from Elkhart, Ind., to White Pigeon, Mich. Representatives of the road stated that the train movement is very light and that the telegraph block system now mainained is quite sufficient.

The Pennsylvania Railroad Commission recommends that the Lehigh Valley amend its rates on coal in order to conform to the statute of 1907. The complaint was based on the charge that the railway was charging the complainant a higher rate on coal than it charged other shippers on coal shipments for longer distances. The defense of the railway was based on the fact that it had never accepted the new constitution of 1874 and that the enforcement of the statute of 1907 forbidding a railway to charge more for a shorter than for a longer haul of the same commodity would be an abrogation of the contract between the Lehigh Valley and the state of Pennsylvania.

The State Railroad Commission of Pennsylvania has held that railways must check baggage through to destination on a combination of two or more tickets. The specific complaint was based on the refusal of the Pennsylvania Lines West to check baggage from a point west of Pittsburgh through to Philadelphia on two tickets, one from the point west of Pittsburgh to Pittsburgh and the other from Pittsburgh to Philadelphia. The sum of the cost of the two tickets was less than the through rate on a through joint ticket. This ruling of the Pennsylvania state commission contrasts with the recent ruling of the Interstate Commerce Commission, which held that a railway should not be compelled to check baggage through to destination on a combination of two tickets where the sum of the cost of the two tickets was less than the through rate.

The New York Public Service Commission has not sustained the complaints of the Syracuse Traffic Bureau, the Utica Traffic Bureau and certain shippers of Troy, as to assistance given by various railways in loading and unloading carload package freight. In the Syracuse case in some instances the assistance asked for in the complaint was given prior to January 1, 1909; in other instances this was not done and undue preference resulted from the rule then in effect. In Utica the practice had not been general of carriers entering that city affording such service, and because of the manner in which team track freight is handled at Utica the relief asked for would not prove of direct benefit to the shipper. In the Troy case the shippers asked that the rule of the companies be extended so as to include all carload freight. The commission here holds that a determination granting the petition must rest on a showing that the furnishing of such assistance is reasonable, and it at this time sees no reason for extending the application of its previous order concerning assistance by tallymen at Troy.

Wisconsin: Abandonment of Unprofitable Branch Lines.

H. W. Brown v. Janesville Street Railway.

The defendant had abandoned a branch line of its system because its operation was unprofitable. The commission holds that if a railway system does not earn enough revenue to pay cost of operation and maintenance because one or more branch lines are operated at a loss so great as to counterbalance the profits on the rest of the system, the interests of the public may be best served by the abandonment of the unprofitable branches. (4 W. R. C., 757.)

Wisconsin: Arrangement of Train Schedule.

H. W. Barker v. Chicago, Milwaukee & St. Paul.

The railway company, after an experiment with a certain local passenger schedule, decided to change the schedule. The complainant asks that the former schedule be put in effect. The commission holds that the arrangement of the train schedule is primarily a matter for the railway management, that the law requires interference by the commission with established schedules only when such schedules do not meet the reasonable requirements of the public. Petition dismissed. (4 W. R. C., 751.)

Wisconsin: Marking L. C. L. Shipments.

Wisconsin Butter Manufacturers and Milk Producers Protective Association v. Chicago & North Western et al.

This case is similar to the *So. Wis. Cheesemen's Prot. Assn. et al. v. Wisconsin Central*, and the complainant claims that the rule in western classification requiring the marking of every package of butter and eggs with the full name of the consignee is unreasonable. The commission again holds that this rule is unreasonable, and besides ordering the defendants in this case to change this rule in their tariffs, the commission recommends that all carriers change the rule on all L. C. L. shipments. (4 W. R. C., 494.)

Wisconsin: Rate and Cost of Service.

Webster Manufacturing Co. v. Chicago, St. Paul, Minneapolis & Omaha.

In a petition asking that a rate on lumber be reduced from 7.5 cents per 100 lbs. to 6.5 cents, the commission holds that while railways are ordinarily entitled to rates that are high enough to cover cost of operation and reasonable returns on the investment, nevertheless the reasonableness of a rate is largely measured by the cost of service to the carrier, modi-

fied by commercial and competitive conditions. The rate complained of is discriminatory and the lower rate asked for in the petition is not found to be unreasonably low when measured by cost of service to the carrier. (5 W. R. C., 95.)

Wisconsin: Spur Tracks Part of Public Facilities.

Eden Independent Lime & Stone Co. v. Chicago & North Western. Union Lime Co. and Nast Brothers Lime & Stone Co. interveners.

This case is given a rehearing to permit interveners to state their objections to an order of the commission requiring the Chicago & North Western to build a spur track to the plant of the complainant. The interveners claim that the facilities of the railway are already taxed to the full, and that the building of a new spur track would interfere with the business of the interveners who already have spur tracks to their plants. The commission holds that the spur tracks of a railway are as much a part of its property as are its other tracks, and that therefore their use belongs to the public as a whole and is not confined to the company whose plant they run to. In the present case, if the claim of the interveners as to crossing of defendant's tracks can be sustained, they should enter a complaint on the ground of inadequate service against the Chicago & North Western and not join with the C. & N. W. in a protest against the addition of new facilities. The Chicago & North Western is required to build the spur track asked for in the original petition. (4 W. R. C., 788.)

COURT NEWS.

The railways of Oklahoma have appealed to the state supreme court from the order of the corporation commission requiring them to establish general offices in Oklahoma by June 1. The court has issued an injunction restraining the commission from enforcing the order while litigation is pending.

The United States circuit court at St. Paul, May 28, refused to consider the application of the Great Northern for an injunction against the enforcement of the Interstate Commerce Commission's order to reduce sleeping car rates. It was held that the Great Northern should go to Chicago and join the Pullman Company in the similar suit instituted there.

John J. Seddon, special master in chancery of the United States circuit court at St. Louis, has filed his report in the suit of the Missouri, Kansas & Texas and other railways to restrain the Interstate Commerce Commission from enforcing its order reducing the rates on cattle moving from the Southwest. The railways alleged that the commission's order was confiscatory. The special master finds that the rates are not confiscatory and recommends that the suit be dismissed.

The supreme court has also decided against the Interstate Commerce Commission in the Denver rate cases. The court also upheld the circuit court in granting an injunction against the enforcement of the statute of March 19, 1907, relating to the stoppage of interstate commerce trains at Lathrop, Mo. The court affirmed the judgment of the lower court in favor of the Atchison, Topeka & Santa Fe, whose charter also was being threatened because it had removed a suit from a state to a federal court.

The supreme court of the United States, by a vote of four to three, has sustained the order of the Interstate Commerce Commission for the reduction of freight rates in the Missouri river rate case. This case, heretofore reported in the *Railway Age Gazette* (Sept. 3, 1909), was based on orders of the commission issued in June, 1908, reducing the proportion between the Mississippi river and the Missouri on freight rates from the Atlantic seaboard to points west of the Missouri. The reduction on first class was about 9 cents per 100 lbs., and on other classes in proportion. The circuit court in the Northern district of Illinois issued an injunction against the commission on the ground that the order discriminated unjustly against intermediate localities. The commission and consignees in Missouri river cities appealed from this decision.

Railway Officers.

ELECTIONS AND APPOINTMENTS.

Executive, Financial and Legal Officers.

Eugene Corley, secretary to the president of the Texas Midland, has been appointed assistant to the president, with office at Dallas, Tex.

C. T. Scaife has been appointed chief claim agent of the Illinois Central, with office at Chicago, succeeding Lawrence H. Kellogg, resigned.

Joseph M. Bryson, assistant general counsel of the Missouri, Kansas & Texas, with office at St. Louis, Mo., has been appointed general solicitor.

Edwin Travis Lamb, who has been elected president and general manager of the Norfolk Southern, as previously announced in these columns, was born on June 29, 1863, at Richmond, Va. He attended a school conducted as an adjunct to William and Mary College until 1878, when he discontinued his studies there to engage in the lumber business. Three years later he began railway work as a receiving clerk in the construction department of the Chesapeake & Ohio at Newport News. That company was then building its lines into Newport News, and Mr. Lamb received his first insight into practical construction work. Six months later he was promoted to chief clerk at the export pier. He remained in that position for about two years and then went to New York as chief receiving clerk for the United States & Brazil Mail Steamship Company. Six months later he returned to Newport News as chief clerk on the export pier of the Chesapeake & Ohio, and joint representative of the C. & O., the United States & Brazil Mail Steamship Company and the Ducal Line. In 1888 he became agent for the Richmond & Danville at Danville, Va., and in March, 1890, was placed in charge of the Richmond & Danville deepwater terminal at West Point, Va., as general forwarding agent, and also acted as joint representative of the Old Dominion Steamship Company, Merchants & Miners Transportation Company, the Clyde Steamship Company, the York River Line and the Richmond & Danville, Railroad. In 1896 the Southern Railway absorbed the Richmond & Danville and transferred its deepwater terminal from West Point, Va., to Norfolk, Va., with Mr. Lamb in charge as general agent at Norfolk, having control over its entire business at that point. He organized and superintended the construction of the Southern Railway's new terminal, one of the largest and best equipped on the Atlantic coast. He also at this time acted as general agent of the Chesapeake Steamship Company. In November, 1906, he was appointed superintendent, and his jurisdiction extended over the Norfolk division of the Southern, in addition to the duties of his former position, and on June 15, 1909, he was made general manager for the receivers of the Norfolk & Southern, which position he held at the time of his recent election as president and general manager of the Norfolk Southern, successors of the Norfolk & Southern.

Edwin T. Lamb.

Carroll M. Bunting, assistant comptroller, has been apponted comptroller of the Pennsylvania Railroad and controlled lnes east of Pittsburgh and Erie, succeeding Max

Riebenack, deceased. Edward A. Stockton, assistant comptroller, has been appointed to the new position of deputy comptroller, and John S. Donaldson, auditor of miscellaneous receipts and accounts, has been appointed assistant comptroller, succeeding Mr. Bunting, all with offices at Philadelphia, Pa.

C. L. Nash has been appointed auditor of the Interstate Railroad, with office at Stonega, Va. Mr. Nash was previously for seven years a traveling auditor and provincial treasurer under the United States Treasury Department in the Philippines and was later with the Bureau of Statistics and Accounts of the Interstate Commerce Commission. At the time of his recent appointment Mr. Nash was in the office of A. H. Plant, comptroller of the Southern Railway, with office at Washington, D. C.

Sir George S. Gibb, formerly general manager of the North-Eastern Railway, of England, and until now chairman of the Underground Electric of London, is widely known and has many friends among railway officers in this country, where he has visited frequently, making close studies of American railway practice. His studies here as well as in Europe resulted in a rather startling reformation, both in the administration and in the accounting, of the North-Eastern Railway. The guiding principle of his scheme, entirely new in England, was the separation of the commercial work from the technical work. He established also a system of accounting quite like that which prevails here; that is passenger-mile and ton-mile records and other statistics designed to furnish a more accurate method of comparison of one year's work with another, and also to form a basis for studies of economy in working. In carrying this out he received the cordial support of his own directors and loyal service from his associates and employees, but the bitter opposition of substantially all other British railway companies. His reformations were not alone in form. With, as he believed, a clearer and a more definite knowledge gained from his statistics, he was enabled to make intelligently somewhat radical changes in locating and arranging his trans-shipping and connecting points so as to get more nearly full carloads. Observing the results so obtained, he was also enabled to determine somewhat accurately the economic size and capacity for his cars and trains on different divisions. All this seems somewhat commonplace to an American railway officer. It is notable when we consider that the work was done by a Scotch lawyer, with no railway experience except in the law department and against the advice of practical men in Great Britain, many of them close friends and men for whose attainments he had a profound respect. Unassuming and always affable, cautious and full of regard for others, he nevertheless followed his own lights. He was not quick in making these changes—he was slow, studious and cautious.

Sir George S. Gibb.

On the death of Mr. Yerkes the affairs of the Metropolitan District Railway and the underground tubes, then in course of construction, were in an almost hopeless condition, all candidates for a receivership, and it was not surprising that this self-contained railway officer was invited to become chairman and managing director. In view of his remarkable success with the North-Eastern Railway and his comfortable situation there, it was surprising that he accepted the newly offered responsibility; that is, it would be surprising to one who did not know Sir George. He had solved hard problems, he was quite ready to undertake more difficult ones, and apparently did not consider the disheartening effect of probable failure. He began the new work in 1906. Both the Metropolitan District and the Tubes have passed through their crises. They are reasonably safe as financial propositions. They are as well organized and in as good shape for making the most of their opportunities as it is probably possible for any one to have made them; and at this point, instead of quietly enjoying the fruits of his hard labor and great anxieties, he is making an entire change in the field of his activities.

A new department, or bureau, was established in England last year by the enactment of the Development and Road Improvement Funds law. Sir George has accepted the post of chairman of the Road Board so created, and its functions are to make advances to highway authorities for the construction of new roads, and also to construct and maintain new roads. It involves great undertakings and great responsibilities and there are many hard problems to solve, but, as Sir George expresses it: "There will be no anxiety—no dividends to earn."

Sir George was born 60 years ago in Aberdeen. He studied law and went to London early, finding no prepossession in his favor because he was a Scot—indeed, somewhat the reverse of it. He was also somewhat handicapped by a burr, which is perhaps more intense in Aberdeen than in any other part of Scotland. Nevertheless, he came up rapidly in the law department of the Great Western Railway and later the North-Eastern Railway, until in 1891 he became general manager of the North-Eastern at a time when it was passing through a crisis. His later railway experience is indicated above.

Many of his activities have been outside of his regular calling. The Boer war developed radical defects in the war office and Gibb was made a member of the committee which thoroughly investigated and reorganized that office in 1901. It was probably largely due to this service that he received the honor of Knighthood in 1904. He was also an efficient and effective member of the Royal Commission on London Traffic, which visited this country a few years ago studying the traffic conditions of the principal cities.

Taken altogether, Sir George's career shows an unusual example of sturdy and studious character. It is probable that he has been rarely, if at all, in error in his conclusions on great questions and, having arrived at a conclusion, he is unalterable. His investigations have always been so thorough and deliberate that he had a justifiable confidence. His new work is such as many of our railway officers might well envy—the duties of a sage rather than an administrator, with an opportunity for great usefulness.

N. P. Ramsey, whose appointment as vice-president and general manager of the Ashland & Western, with office at Ashland, Ohio, has been announced in these columns, was born in Pittsburgh, Pa., May 30, 1848. He entered railway service in 1872 on the Bell's Gap Road and continued with that company until 1879, when he was made general freight and passenger agent of the Pittsburgh, New Castle & Lake Erie. He held positions consecutively as auditor of the Pittsburgh Southern, chief clerk in the accounting department of the Baltimore & Ohio at Pittsburgh, general freight and passenger agent of the Pittsburgh, Chartiers & Youghiogheny, auditor of the Dayton, Fort Wayne & Chicago, general manager of the Cincinnati, Wabash & Michigan, special agent of the Wabash in charge of mail traffic, and secretary and treasurer of the West Virginia & Ohio Construction Co. He will continue to hold the latter position.

Operating Officers.

J. M. Davis has been appointed general superintendent of the northern district of the Southern Pacific, succeeding J. H. Young, resigned.

David O. Ouellet, chief despatcher on the St. Louis, Iron Mountain & Southern, has been appointed trainmaster at Little Rock, Ark. W. J. Potts succeeds Mr. Ouellet.

F. L. Corwin, trainmaster on the Eastern division of the Western Pacific, at Elko, Nev., has been transferred to the Western division, with office at Sacramento, Cal.

T. L. Dubbs, superintendent of the Illinois Central at

Corinth, Miss., has been appointed division superintendent of the Yazoo & Mississippi Valley at Memphis, Tenn., succeeding John F. Porterfield, transferred.

E. J. Lampert, superintendent of the Missouri, Kansas & Texas, at Kansas City, Mo., has been appointed superintendent of transportation at Denison, Tex. A. G. Peek, agent at McAlester, Tex., succeeds Mr. Lampert.

W. Rudd, trainmaster of the Missouri, Kansas & Texas of Texas at Denison, Tex., has been appointed superintendent at Smithville, Tex., succeeding C. M. Bryant, whose promotion has been announced in these columns.

C. Peter Clark, vice-president and general manager of the Buffalo & Susquehanna, at Buffalo, N. Y., has resigned. J. O. Crockett, who recently resigned as general superintendent of the Evansville & Terre Haute, at Evansville, Ind., succeeds Mr. Clark as general manager of the Buffalo & Susquehanna, with office at Galeton, Pa.

T. W. Evans, superintendent of the Rochester division of the New York Central & Hudson River, at Rochester, N. Y., has been appointed superintendent of the Buffalo division, with office at Buffalo, succeeding I. H. McEwen, transferred. F. E. McCormack, superintendent of the Ontario division at Oswego, succeeds Mr. Evans, with office at Rochester, and S. J. Kearns, assistant division superintendent at Syracuse, succeeds Mr. McCormack, with office at Oswego.

Albert E. Clift, superintendent of the St. Louis division of the Illinois Central, with headquarters at Carbondale, Ill., has been appointed general superintendent of the lines south of the Ohio river, and the headquarters of the general superintendent of these lines has been moved from Memphis, Tenn., to New Orleans, La. Mr. Clift succeeds Henry McCourt, assigned to other duties. John F. Porterfield, division superintendent of the Yazoo & Mississippi Valley, at Memphis, Tenn., succeeds Mr. Clift.

Traffic Officers.

B. R. Bloodworth has been appointed a traveling freight agent of the Central of Georgia.

H. L. Resing has been appointed commercial agent of the Pacific & Idaho Northern at Weiser, Idaho.

G. A. Griffin has been appointed a traveling passenger agent of the Mobile & Ohio, with office at Meridian, Miss.

R. H. Heard, general agent of the Chicago Great Western at Minneapolis, Minn., has resigned to engage in private business.

C. C. Graves has been appointed general freight and passenger agent of the Raleigh & Charleston, with office at Marion, S. C.

B. J. Libbe, general agent freight department of the Atchison, Topeka & Santa Fe at St. Louis, Mo., has resigned to go into other business.

William J. Oliver has been appointed a soliciting agent of the Southern Railway, with office at Norfolk, Va., succeeding R. D. Miller, promoted.

G. M. Kridler has been appointed general agent of the Toledo & Ohio Central and the Zanesville & Western, with office at Pittsburgh, Pa.

U. S. Pawkett has been appointed traffic manager of the Pecos Valley Southern, a road building south from Pecos, Tex., with office at Dallas, Tex.

J. R. Randolph has been appointed a traveling freight agent of the Central of Georgia, with office at Jacksonville, Fla., succeeding J. E. Roach, resigned to go to another company.

G. L. Townsley has been appointed Pacific Coast agent of the St. Louis Southwestern at San Francisco, Cal. His territory will comprise California, Nevada, Oregon, Washington and Arizona.

E. M. North, division passenger agent of the Atlantic Coast Line at Savannah, Ga., has been appointed assistant general passenger agent, with offices at Savannah, and his former position has been abolished.

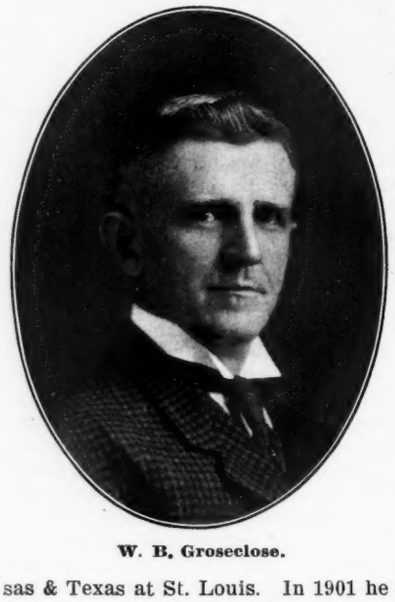
L. V. Druce, commercial agent of the Grand Trunk, the Grand Trunk Pacific and the Grand Trunk Pacific Steamship Co., Ltd., at Seattle, Wash., has been transferred to Vancouver, B. C. F. L. Norman succeeds Mr. Druce, with office at Seattle.

D. J. Bill has been appointed a commercial agent of the Lake Erie & Western, the Fort Wayne, Cincinnati & Louisville and the Northern Ohio, at Buffalo, N. Y., succeeding F. A. Curry, whose promotion has been announced in these columns.

The following appointments have been made on the Star Union Line: Wm. J. Barr, traveling freight solicitor, with headquarters at Spokane, Wash.; Edward S. Yeaton, traveling freight solicitor, with headquarters at Seattle, Wash.; Judson T. Smith, now agent at Fargo, N. D., traveling freight solicitor, with headquarters at Portland, Ore. I. C. Furber succeeds Mr. Smith.

J. B. Rector has been appointed traffic manager of the Estacado & Gulf, with office at McCauley, Tex. Mr. Rector served the Atchison, Topeka & Santa Fe for 17 years, resigning in 1908 to accept a position as agent of the St. Louis & San Francisco. In his new position he will have charge of the freight and passenger business of the new line building into Robey, Fisher County, Tex.

Wm. B. Groseclose, whose appointment as assistant freight traffic manager of the Missouri, Kansas & Texas, with office in Chicago, has been announced in these columns, was appointed a commercial agent of the St. Louis, Arkansas & Texas Ry. of Texas, now the St. Louis, Southwestern Ry. of Texas, in 1888. He was promoted to general agent and later to general freight agent of this road, which position he resigned to become general manager of the Tyler Car & Lumber Co., Tyler, Texas. In 1895 he was appointed assistant general freight agent of the Missouri, Kansas & Texas Ry. of Texas, at Houston, Tex., and three years later he was made assistant general freight agent of the Missouri, Kansas & Texas at St. Louis. In 1901 he was promoted to general freight agent, the position he leaves to become assistant freight traffic manager.



W. B. Groseclose.

W. E. Lowes has been appointed an assistant general passenger agent of the Baltimore & Ohio, with office at Baltimore.

D. N. Bell, division ticket agent of the New Jersey division of the Pennsylvania Railroad at Philadelphia, Pa., has been appointed an assistant general passenger agent, with office at Philadelphia, and R. J. De Long, division ticket agent of the West Jersey & Sea Shore at Philadelphia, succeeds Mr. Bell.

B. W. Redfearn, who has been appointed general perishable freight agent of the St. Louis & San Francisco, with office at St. Louis, Mo., began work on the Frisco in December, 1905 as dairy freight agent in charge of the butter, egg and poultry traffic; in June, 1907, his jurisdiction was extended over the Rock Island Lines, with title of general dairy agent, and at the time of the separation of the Rock Island-Frisco Systems he retained his position as general dairy agent of the Frisco Lines. Coming to the Frisco, he was general manager and traffic manager of the Jean-Hurst-Redfearn Produce Co., which during its existence was the largest poultry and egg concern in the country. Mr. Redfearn is 42 years of age.

Engineering and Rolling Stock Officers.

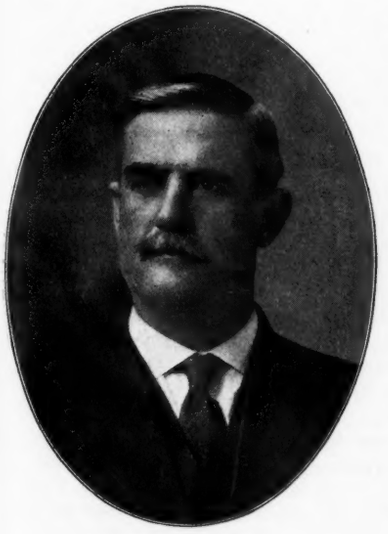
Jule Brown, traveling engineer for the St. Louis Southwestern, has resigned to enter private business.

Donald R. MacBain, whose appointment as superintendent of motive power of the Lake Shore & Michigan Southern, with office at Cleveland, Ohio, has been announced in these columns, was born October 23, 1861, at Queenston Heights, Ont. He was educated in the common schools and began railway work as a machinist's apprentice October 9, 1876, on the Canada Southern, now a part of the Michigan Central. Two years later he was promoted to locomotive fireman, remaining in that position until November, 1882, when he was appointed a locomotive engineman. In May, 1890, he was appointed a traveling engineer, and ten years later was made master mechanic at Michigan City. In April, 1901, he was transferred to St. Thomas, Ont., and about a year later was transferred to Jackson, Mich. He was appointed assistant superintendent of motive power of the Michigan Central in July, 1906, and was transferred in the same capacity to the New York Central & Hudson River in April, 1908, which position he held at the time of his recent appointment as superintendent of motive power of the Lake Shore & Michigan Southern, the Chicago, Indiana & Southern and the Indiana Harbor Belt.

D. R. MacBain.

M. Flanagan, foreman of the machine department of the Chesapeake & Ohio at Richmond, Va., has been appointed master mechanic of the Richmond division, with office at Richmond.

Charles H. Terrell, whose appointment as superintendent of motive power of the Chesapeake & Ohio, at Huntington, W. Va., has been announced in these columns, was born on March 1, 1858, in Hanover county, Va. Mr. Terrell was educated in the public schools and began railway work on June 11, 1874, with the Chesapeake & Ohio as machinist apprentice. He served the full apprenticeship as machinist, and left the service of the Chesapeake & Ohio five years later, and then worked as a machinist in various shops, returning to the Chesapeake & Ohio in 1883 as a machinist. Two years later he went to the Utah Northern, now a part of the Oregon Short Line, as a night roundhouse foreman at Eagle Rock, Idaho. He then went to the Chicago & North Western as roundhouse foreman at Missouri Valley, Iowa, and again went to the Chesapeake & Ohio in the fall of 1886 as machine foreman and later as general foreman. In 1903 he was promoted to master mechanic on the Kentucky division, which position he held at the time of his recent appointment as superintendent of motive power of the West Virginia general division.



C. H. Terrell.

A. McGill has been appointed roadmaster of the second division of the St. Louis, Brownsville & Mexico, succeeding W. F. Sparks, resigned to enter private business.

C. D. Magner has been appointed division roadmaster of the Gulf, Colorado & Santa Fe, at Conroe, Tex., succeeding Samuel Lincoln, whose transfer has been announced in these columns.

C. D. Purdon has been appointed chief engineer of the St. Louis Southwestern, and W. T. Eaton, chief engineer of the St. Louis Southwestern of Texas, succeeding M. L. Lynch, retired from both companies.

J. W. Senger, whose appointment as master car builder of the Lake Shore & Michigan Southern has been announced in these columns, has been appointed also master car builder of the Chicago, Indiana & Southern and the Indiana Harbor Belt, with office at Englewood, Ill., succeeding T. H. Goodnow, resigned to go to another company.

J. T. Carroll, whose appointment as superintendent of motive power of the Pittsburgh system of the Baltimore & Ohio, has been announced in these columns, was born on June 12, 1875, at Cassadaga, N. Y., and was educated at Purdue University, Lafayette, Ind. On September 10, 1891, he entered the service of the Brooks Locomotive Works as draftsman, remaining with that company until January, 1896, since which time he has been consecutively draftsman on the Erie Railroad, the Chicago, Rock Island & Pacific and the Chicago & North Western. In August, 1899, he was appointed mechanical engineer of the New York, Chicago & St. Louis, and has been on New York Central Lines west of Buffalo since.

J. T. Carroll.

OBITUARY.

W. R. Tiffin, superintendent of the Grand Trunk at Allendale, Ont., died May 29 at Barrie, Ont. Mr. Tiffin was born in 1844 at Hamilton, and began railway work in 1860. He was appointed superintendent of the Northern division of the Grand Trunk in January, 1897.

Charles Cameron Clarke, vice-president and director of the New York & Harlem Railroad and the New York & Putnam, and former vice-president of the New York Central & Hudson River, died on May 25 at his home in Ossining, N. Y. Mr. Clarke was born at Canandaigua, N. Y., February 24, 1823. He was appointed auditor of the Hudson River Railroad on May 19, 1854, and two years later was made treasurer of the company. Soon after the consolidation of the Hudson River with the New York Central & Hudson River in 1869 he was chosen treasurer of the new company and held the place for over 20 years. He was appointed first vice-president of the New York Central & Hudson River in May, 1883, and remained in that position until November, 1900. For many years while vice-president Mr. Clarke had the oversight of both the financial and the accounting departments of the road, and his duties were almost synonymous with those of what used to be called the managing director. Mr. Clarke was a widower and left three children, Charles C. Clarke, who is a professor in Yale University; Mrs. Charles T. Titus, of Utica, and Francis Cameron Clarke, a purchasing agent of the New York Central Lines.

Railway Construction.

New Incorporations, Surveys, Etc.

Abilene & Southern.—A contract is said to have been given to Rose & Ellis for grading four miles out of Hamlin, Tex., on the proposed extension from Abilene north via Anson to Hamlin, about 40 miles. (May 20, p. 1281.)

Alaska Short Line.—The lower house of Congress has passed a bill extending the time to June, 1911, to begin work on this line. The projected route is from Cooks Inlet, Alaska, northwest across southwest Alaska to Anvik, 360 miles.

Algoma Central & Hudson Bay.—A contract is said to have been given to the O'Boyle Brothers Construction Co., Sault Ste. Marie, Ont., for the clearing, grading and bridge work on the 31-mile extension between Hawk Lake Junction, Ont., and Hobon. (April 22, p. 1070.)

Atlanta, Birmingham & Atlantic.—This company is said to have started operating trains on June 1 over its own tracks, into Birmingham, Ala., via the new extension from Bessemer, northeast to Birmingham. (May 6, p. 1183.)

Bingham & Garfield.—Work is said to be under way by the Utah Construction Co., building this line from Bingham, Utah, north to Garfield, 17 miles. The work includes 300,000 cu. yds. of earth excavation, 800,000 cu. yds. of rock excavation, 1,000,000 cu. yds. of embankment and 6,200 lin. ft. of rock tunnels, also 7,000 cu. yds. of concrete masonry and three steel and concrete bridges. Subcontracts are said to be let to Boyer Brothers, Taylor Brothers, W. M. Smith, R. Palfreyman, the Wasatch Construction Co. and F. Meyers & Co.

Caldwell, Roswell & Big Bend Interurban.—An officer writes that this company was organized in Idaho, with $250,000 capital, to build an electric line from Caldwell, Idaho, northwest via Roswell to the Big Bend, 27 miles. Maximum grades will be 0.5 per cent. and maximum curvature 4 degs. H. W. Dorman, president; H. S. Williams, chief engineer, Caldwell.

Canadian Northern.—This company is said to have secured $40,700,000 in Europe for the railway and allied projects in western Canada. Part of the funds are to be used for development as follows: For the Canadian Northern, $5,000,000; Winnipeg street railway development, $1,000,000; new steamships for the Canadian Northern Railway subsidiary companies, $3,000,000, and for the Duluth, Winnipeg & Pacific Railway, $4,700,000. The completion of the D., W. & P. from Virginia, Minn., south 74 miles to Duluth, will provide a through connection from Edmonton, Alb., via the Canadian Northern and the Chicago & North Western into Chicago. (See Duluth, Rainy Lake & Winnipeg, Feb. 25, p. 429.)

A contract is said to have been given recently to C. J. Merry & Co. for building 35 miles of line between Shell Brook, Sask., and Battleford, the work to be finished during 1910. It is expected to have the line from Prince Albert southwest to Battleford finished during 1911.

Carnesville Railway.—Organized in Georgia, with $200,000 capital and office at Toccoa, Ga. The plans call for a line from Toccoa south via Mize and Redhill to Carnesville, 20 miles. The incorporators include W. S. Erwin, E. S. Hunnicutt, Clarkesville; W. G. Davis, Toccoa; W. H. Parker, Mize; W. P. King, Redhill, and J. R. Hall, Carnesville.

Central Ohio Promoting Co.—An officer writes that under this name a company has been organized in Ohio with $25,000 capital to build an electric line from Columbus, Ohio, east to Zanesville. The projected route from Columbus is via Reynoldsburg, thence southeast to Holden, and east via Coyle and Glenford to South Zanesville. There is to be a branch from a point south of Columbus, at Franklin, east to a connection with the main line at Holden, and another branch from the main line at a point east of Columbus, south via Groveport and Canal Winchester to Amanda, thence east via Rockbridge to Corning, with spur lines to Shawnee and to Newstraits. J. L. Holden, president and treasurer; Albert E. Boone, general manager and assistant secretary. The offices of the company are at 403 Hayden-Clinton building, Columbus.

Coeur d'Alene & Pend d'Oreille.—See Spokane International.

Denver & Rio Grande.—An officer writes that the recent press reports concerning plans of this company for future construction are very much exaggerated. On May 18 the company awarded contracts to the Utah Construction Company as follows: Grading double track from Swallows, Colo., to Goodnight, 10.5 miles, involving removal of about 550,000 cu. yds. of grading. Work to be commenced at once and finished by September. There will also be three double-track 85-ft. bridges to be erected and a number of 16 and 24-ft. I beams, all on concrete masonry. Track is to be laid with 85-lb. steel and ballasted with slag.

The same firm was awarded a contract to grade double-track between Pando, Colo., and Pando Tunnel, on the Mountion division, 1.75 miles. There will be about 60,000 cu. yds. of grading. This work is to be finished by July.

Denver, Laramie & Northwestern.—According to press reports the extension from Milliken, Colo., north to Greeley, 12 miles, has been finished and trains are now in operation. An extension is projected north of Greeley towards Laramie, Wyo. (May 6, p. 1183.)

Duluth, Winnipeg & Pacific.—See Canadian Northern.

Gilmore & Pittsburgh.—An officer writes that construction work is nearly completed on the line building from Armstead, Mont., west to Salmon City and to Gilmore, Idaho. The McArthur Brothers' Construction Co., New York, are the contractors. According to press reports, plans have been filed in Montana to build from the eastern terminus at Armstead, north to Butte, with a connection from this line east to Whitehall. It is understood that the Hill interests are back of this project. (Jan. 7, p. 68.)

Holton Inter-Urban.—An officer writes that this company expects to build some time this year, under the name of the Imperial Valley Railway, extensions from the present western terminus of the Holton Inter-Urban at El Centro, Cal., to a point southwest of El Centro, and another line from El Centro, west to Seeley, with a branch running north from both these lines via Imperial to a point east of that place. A line is also to be built from the existing line at a point near the eastern terminus, at Holtville, southwest to Calexico, and another line is to be built from a point south of Holtville, north via Holtville, thence west via Brawley, and then to a point northwest of that place. Track laying is now under way on the line west to Seeley, and it is expected to have this work finished by July, 1910. At the present time the company is using steam as its motive power on the existing line from Holtville, west to El Centro, 11 miles. W. F. Holt, president and general manager, Redlands.

Imperial Valley.—See Holton Inter-Urban.

McCrory & Beedeville.—Organized in Arkansas to build a 14-mile line from McCrory, Ark. Right-of-way is now being secured. C. Hailey, president; G. G. McCrory, general manager and chief engineer, McCrory.

Minneapolis, St. Paul & Sault Ste. Marie.—An officer writes that this company has work under way as follows: Extension from Moose Lake, Minn., northwest via McGregor, Cass Lake and Bemidji, to Plummer, 192 miles. Grading and bridge work is expected to be finished by July and track laying in September, 1910. The work is moderately heavy, mostly through earth. The line is to have maximum grades of 0.3 per cent. and maximum curvature of 1 deg. There will be steel bridges over the Mississippi river and Leech Lake river, and a union station at Bemidji, to be used jointly with the Minnesota & International.

The Cuyuna, Minn., line has been graded, track laid on 48 miles, and ballasting work is nearing completion.

On the line from Medford, N. Dak., west to Drake, 130 miles, it is expected that the grading, bridges and track laying will be completed this summer. The character of this work is moderately heavy, with light grades and easy curva-

ture. A contract for building this line was let some time ago to Foley, Welch & Stewart, St. Paul, Minn.

NUECES VALLEY RAILROAD.—A charter has recently been filed with the Secretary of State of Texas. It provides for the construction of a railway from Beeville, Tex., to Eagle Pass, 175 miles. Lee Frisby, of Austin; R. M. Buck, of Fort Smith, Ark.; W. A. Frisby, of Beeville, and others are the incorporators. It is stated that the road has been financed in Philadelphia and that the construction contract will soon be let.

OKLAHOMA PUBLIC SERVICE & INTERURBAN.—An officer writes that contracts were let recently to Dan Sweeney & Co. for dirt work, and to M. B. Ryan for bridge construction and culverts on 14 miles of electric line in Oklahoma. The company will also put up a power house, substations, a terminal building, car barn and shop building. L. J. Lampke, president, and R. A. Sturgeon, chief engineer, Stillwater.

PENNSYLVANIA RAILROAD.—The track elevation work on the Kensington branch of the Pennsylvania Railroad in the northeastern part of Philadelphia, Pa., which was started in 1907, has been finished. The improvements included the elimination of 33 grade crossings on Trenton avenue. The grade crossings eliminated also include one at Lehigh avenue, where the tracks of the Pennsylvania cross some five or six tracks of the Philadelphia & Reading.

The extension of the Bedford & Hollidaysburg Railroad from a point 2.44 miles north of Imlar, Pa., passenger station, to Brookes Mills, 10.85 miles, has been completed, together with a number of sidings and is now being operated as a part of the Bedford division.

ST. LOUIS, IRON MOUNTAIN & SOUTHERN.—A contract is said to have been given to the Walsh Construction Co., Davenport, Iowa, for double-tracking work from McAlmont, Ark., northeast to Bald Knob.

SIOUX CITY & EASTERN TRACTION CO.—Incorporated in Iowa to build an interurban line from Sioux City, Iowa, southeast to Denison, about 70 miles. The officers of the company are: A. H. Tennis, president; W. B. Goodrich, vice-president; H. C. Fedderson, treasurer, and W. L. Harding, secretary, Sioux City.

SLIPPERY ROCK & GROVE CITY STREET RAILWAY (ELECTRIC).—An officer writes that a contract has been given to A. De Mayo & Co., Ashtabula, Ohio, to build from Slippery Rock, Butler county, Pa., north via Armstrong and Redmond, to Grove City, Mercer county, nine miles. Maximum grades 2¼ per cent., maximum curvature 16 degs. There will be a 90-ft. steel bridge and another 20 ft. long. It is expected to have the line in operation by October 15 of this year. Surveys and rights-of-way have been made and contracts are to be let for building 20 miles additional between Slippery Rock and Butler, at which point connection is to be made with the Pittsburgh, Butler and Harmony lines. J. P. Barr, president; J. A. Jolliffe, secretary; S. L. McClure, general manager, and H. B. Graves, chief engineer, Grove City.

SPOKANE INTERNATIONAL.—According to press reports construction work has been started on the Coeur d'Alene & Pend d'Oreille. The company was organized to build from a point on the Spokane International, 25 miles east of Spokane, southeasterly to Coeur d'Alene City, Idaho. Rails for the entire line are on the way, and it is expected to have the track laying finished in about 60 days. D. C. Corbin, president; E. G. Taber, chief engineer, Spokane. (April 29, p. 1115.)

TALLAHASSEE & GULF.—Organized in Florida, with $10,000 capital, to build from Ocklocknee south through Leon and Wakulla counties, to the Gulf of Mexico, about 40 miles. J. H. Morfleet, president and general manager, Ocklocknee.

TEMISKAMING & NORTHERN ONTARIO.—Bids are wanted by A. J. McGee, secretary and treasurer, Toronto, Ont., up to noon June 8, for clearing, grading, embankment protection, driving of piles, culverts and laying tiles that may be required in connection with the construction of a branch between North Bay, Ont., and Nipissing Junction.

TUSCALOOSA MINERAL.—An officer writes that the prospects of building this line from Tuscaloosa, Ala., east to Brookwood, are good. The company expects to let contracts as soon as the survey is finished. The line will traverse a mineral and timber section of Tuscalcosa county for about 18 miles. The work will include one bridge over Hurricane creek. F. G. Blair, president, and Woolsey Finnell, chief engineer, Tuscaloosa.

UNITED RAILWAYS CO. (EECTRIC), PORTLAND, ORE.—This company, operating a 17-mile line from Portland, Ore., west via Burlington, will push construction work on the extension west to the Pacific coast at Tillamook, in all about 80 miles. John F. Stevens, president of the Oregon Trunk Line, has been elected president of the United Railways Co.; L. B. Wickersham, chief engineer, has been made vice-president, succeeding respectively T. L. Greenough and C. D. Fullen, resigned. (Sept. 10, p. 479.)

VIRGINIA & SOUTHWESTERN.—This company expects to have work finished soon on the branch line from Moccasin Gap, Va., southwest to Persia, Tenn., 47 miles, where connection is to be made with the Rogersville branch of the Southern Railway. The line is being built in the valley of the Holston river. (Dec. 17, p. 1214.)

WEST SHORE RAILROAD (ELECTRIC).—Organized in Pennsylvania to operate a line from Wilkesbarre, Pa., northeast to Pittston, about 10 miles, via the boroughs of Fortyfort, Wyoming and Exeter. Contracts for the work will be let in about four weeks. There will be 2,000 ft. of trestle work, about 10 ft. high. J. L. Dunn, secretary, 54 Public square, Wilkesbarre, and W. T. Hutchins, engineer, Wyoming.

FOREIGN RAILWAY NOTES.

The first section of the railway from San Antonio, in the Argentine, to Nahuel Huapi, has been opened. From this enterprise the government expects that there will be opened to the public a large district of rich land some of which is to-day almost unknown.

A despatch from Kingston, Jamaica, says that J. P. McDonald has been granted a franchise to build about 400 miles of railway in Hayti. The proposed roads will run from Gonaides to Hinche and Grosmore, and from Port au Prince to Cape Haytien and Arcahare.

The agreement made in 1909 between Persia, Great Britain and Russia by which the Persian government agreed not to grant any railway concession to any third power has expired, and the Paris *Temps* says that Great Britain and Russia propose that the agreement should be renewed.

In 1851 the first railway was built in Chili. In 1856 Brazil had a railway open to traffic, and Argentina was beginning to push its solitary line indefinitely across her limitless prairies. There is now no republic in South America without at least one railway. Actual mileage of road does not, however, tell the story of what has been accomplished. Although there are only 37,000 miles of railway in the whole continent these few threads of modern industrial life have revolutionized travel on the southern continent and given access to much useful territory. The one-time mysterious city of La Paz, the active capital of the Republic of Bolivia, altitude 12,300 ft., was formerly as hidden as Lassa in Tibet, and the traveler was lost for weeks who dared to climb the rocky barriers beyond which it lay. But to-day two railways carry passengers from the west coast in less than 48 hours to this lofty interior; a third line is pushing northward from the frontier of Chili to bring La Paz closer yet to the Pacific, while a fourth road, advancing from Argentina, will soon place the city within 1,500 miles of the Atlantic seaboard. Quito in Ecuador is now only six days from Panama, for the railway fills the gap in transportation which lately could be overcome only by a week's travel over hazardous paths on the patient mule. Bogota in Colombia is reached in a day from the Magdalena river, and before the year is forgotten Asuncion in Paraguay, five days by steamer up the river Parana, will be linked to Buenos Ayres by bands of steel.—*Review of Reviews.*

Railway Financial News.

Baltimore & Ohio.—It is said that this company is to sell the controlling interest in the stock of the Valley Railroad (Virginia) to the Southern Railway. The Valley Railroad runs from Harrisonburg, Va., to Lexington, 62 miles, and is operated by the B. & O. as agent. The B. & O. owns $1,703,000 stock and $750,000 bonds.

Beaumont, Sour Lake & Western.—The outstanding first mortgage 6 per cent. bonds of 1905, at last accounts amounting to $267,567, have been called for redemption at par on May 27 at the office of the company.

Berkshire Street Railway.—See New York, New Haven & Hartford.

Canadian Northern.—President William Mackenzie has arranged for the sale in Europe of the following bonds for Mackenzie-Mann properties: Five million dollars Canadian Northern debentures; $4,700,000 Duluth, Winnipeg & Pacific first mortgage bonds, guaranteed by the Canadian Northern; $1,000,000 Winnipeg Electric bonds; £1,500,000 ($7,500,000) 5 per cent. debenture stock; $6,000,000 Brazeau Coal Fields & Railway guaranteed 3½ per cent. bonds; £2,054,800 ($10,274,000) Canadian collieries (Dunsmuir) first mortgage bonds.

Chicago & Alton.—Further details of the mortgage securing $18,000,000 30-year 5 per cent. equipment and improvement bonds of this company show that in addition to the $3,500,000 bonds already issued and deposited under $2,500,000 5 per cent. notes, the company may issue $1,000,000 bonds each succeeding year until 1913, and $1,500,000 bonds each year thereafter until the entire $18,000,000 have been issued.

Chicago, Cincinnati & Louisville.—The upset price on this property, which is to be sold on June 23 under foreclosure, has been fixed at $5,200,000. The property will be sold subject to unpaid equipment liens ranking prior to the mortgages foreclosed, aggregating with interest $618,934.

Chicago, Milwaukee & St. Paul.—It has been formally announced that Kuhn, Loeb & Co., New York, have arranged for the sale to French bankers of 250,000,000 francs ($50,000,000) 4 per cent. 15-year debenture bonds. The bonds will be in denominations of 500 francs ($100) and 2,500 francs ($500), and have been admitted to official quotation on the French Bourse. The bonds will be issued entirely in foreign denominations, probably at the price of 97 per cent.

The *Wall Street Journal* says that contrary to the published statement that St. Paul was compelled to pay 5½ per cent. for the 15-year loan secured in Paris, the money cost the railway only a trifle over 5 per cent., the net to the railway being 88, on a 4 per cent. security. Bankers who conducted the negotiations say that the $50,000,000 bonds could not have been placed in this country on a less than 6 per cent. basis.

Chicago, Rock Island & Pacific.—The New York Stock Exchange has listed $982,000 additional refunding mortgage 4 per cent. bonds due 1934. These additional bonds were issued to acquire $1,000,000 Tucumcari & Memphis first mortgage bonds, which have been deposited with the trustee of the refunding mortgage. The Tucumcari & Memphis runs from Amarillo, Tex., to Tucumcari.

There has now been listed to date a total of $86,118,000 first and refunding mortgage 4 per cent. bonds, of which $29,818,000 were issued for refunding purposes, $15,000,000 for general corporate purposes, $23,800,000 for the acquisition of property or securities and $17,500,000 for improvements.

Delaware & Hudson.—Stockholders have voted to authorize a change in the application of the sinking fund moneys, to permit the sinking fund to be used to pay the cost of the company's increased reserves of coal.

Duluth, Winnipeg & Pacific.—The $1,525,000 bonds of April 30, 1909, have been called for exchange for an equal amount of first mortgage bonds of the Duluth, Winnipeg & Pacific, guaranteed principal and interest by the Canadian Northern.

See also Canadian Northern.

Hocking Valley.—Following the filing of affidavits of prejudice against Judge E. B. Kinkead, of the Common Pleas Court, who appointed the Hocking Valley receivers, by James H. Hoyt, second vice-president of the road, and counsel, Federal Judge Sater, in the United States Court at Columbus has assumed jurisdiction in the case. Judge Sater upheld the petition of the railway for removal of its case to the Federal Court on the ground that the complaint of Mannington and the dissatisfied minority stockholders contained averments of violation of the Sherman anti-trust law, and held that the Federal court therefore clearly has jurisdiction. Judge Sater ruled also that the action of the Hocking Valley in seeking relief in the State Circuit Court after filing a motion to remove to the United States Court did not constitute a waiver of any of its rights, as that action came after the motion to remove and therefore was null. The most important point decided was that the right of injunction does lie in equity cases under the Sherman law, the railways having contended that it did not.

The action of the Common Pleas Court in appointing receivers is annulled. The temporary injunction which was granted against the retirement of the $15,000,000 Hocking Valley preferred stock stands, however, until reviewed by the United States Court.

Interborough-Metropolitan.—Arrangements have been made for the extension, until June 1, 1911, at the same rate of interest, of the $2,500,000 6 per cent. collateral trust six months' notes, due June 1, 1910. These notes are a part of the $8,000,000 6 per cent. six months' collateral notes put out on May 27, 1907, by the Interborough-Metropolitan for the purpose of providing the New York City Railway with funds to electrify various horse car lines and to meet the cost of other improvements then contemplated.

It was the original intention of Interborough-Metropolitan to take up these six months' notes at their maturity, by issuing in their stead 5 per cent. three-year notes. Subsequent events, did not, however, permit this, and at the maturity of the notes approximately one-half were paid off and the remaining portion renewed for the six months.

Missouri, Kansas & Texas.—Stockholders are to vote on July 30 on the question of authorizing a mortgage securing $125,000,000 5 per cent. general mortgage bonds. These bonds will be used for refunding securities now outstanding and for additions and betterments. It is expected that $10,000,000 of the bonds will be issued immediately.

New York, New Haven & Hartford.—The Massachusetts committees on street railways and on steam railways sitting jointly have voted to report the bill authorizing the New Haven to own stock in the Berkshire Street Railway and to require the building of certain street railways by the Berkshire company.

Norfolk & Western.—The New York Stock Exchange has listed $10,993,000 additional convertible 10-25 year 4 per cent. bonds, which were recently offered to stockholders. The proceeds of these bonds will be used approximately as follows: Three thousand eight hundred dollars for second-track, $200,000 for yards, $100,000 for sidings, $3,100,000 for branch lines and $3,800,000 for equipment.

Southern Pacific.—It is said that the bankers of the Southern Pacific, presumably Kuhn Loeb & Co., New York, have have arrangements for the sale of about $10,000,000 bonds of the Southern Pacific in Germany.

Southern Railway.—See Baltimore & Ohio.

Texas Central.—R. H. Baker, formerly president of the Trinity & Brazos Valley, has taken an option, expiring June 4, on the controlling interest of the Texas Central.

Tucumcari & Memphis.—See Chicago, Rock Island & Pacific.

Valley Railroad (Va).—See Baltimore & Ohio.

Western Ohio.—Hayden, Miller & Co. are to buy $500,000 Western Ohio second mortgage 6 per cent. bonds. These bonds are convertible at par into a new issue of Western Ohio first preferred 7 per cent. stock. The proceeds of the new loan will be used to retire the outstanding Western Ohio notes due 1912.

Supply Trade Section.

Charles Chew Mickle, general manager of the Trojan Car Coupler Co., New York, has resigned, effective June 1.

Geo. A. Rees has been elected second vice-president of the Chicago Pneumatic Tool Co., with office in the Fisher building, Chicago.

The King-Lawson Car Company, New York, has moved its office from 17 State street to room 288, Metropolitan tower, No. 1 Madison avenue.

Burton W. Mudge & Co., Peoples Gas, Light & Coke Company's building, Chicago, have been appointed western sales agents for the Baker-Pilliod locomotive valve gear, manufactured by the Pilliod Co., Swanton, Ohio.

The Joliet Railway Supply Co., Chicago, has received orders for Huntcon brake beams specified on the following recent car orders: 1,000 New York Central, from Pressed Steel Car Co.; 1,000 Chicago, Burlington & Quincy, from Pressed Steel Car Co.; 1,500 Grand Trunk, from American Car & Foundry Co.; 250 Duluth & Iron Range.

The Acme Railway Equipment Co., Philadelphia, Pa., reports that its Acme universal uncoupling device is being applied to 500 gondola cars for the New York, Ontario & Western; 250 box cars and 250 gondola cars for the Pittsburgh, Shawmut & Northern, building at the Berwick plant of the American Car & Foundry Co., and to 700 box cars for the Maine Central, building at the Sagamore, Mass., plant of the Standard Steel Car Co.

The Indianapolis Switch & Frog Co., Springfield, Ohio, reports extensive sales of its manganese solid bronze crossings and switch points, and that it had recently placed on the market several new designs which embody features said to be of exceptional merit. This company's universal type manganese frog, adaptable for railway work, makes it possible for this company to carry regular sizes and numbers of manganese frogs in stock for the various weight of rail for immediate delivery.

TRADE PUBLICATIONS.

Lighting Transformers.—The Allis-Chalmers Co., Milwaukee, Wis., has issued Bulletin No. 4022 describing the lighting transformers which it builds. Copies may be had on application to the company.

Water Softener.—The Dodge Manufacturing Co., Mishawaka, Ind., has issued two hangers illustrating the Eureka water softener. One shows an exterior view and the other a colored cross section to illustrate every step in the process. The cards are 14 in. x 26 in. and the engraving is especially well done.

Great Northern.—"To the Scenic North West" is the title of a descriptive booklet issued by the passenger department of the Great Northern. The larger cities and resorts reached by this line are well described and illustrated. Another booklet of 144 pages issued by the industrial department gives business openings along the lines of this company. The information is conveniently arranged for ready reference and a large part of the book is devoted to short descriptions of the towns in which there are business openings. Another booklet is devoted to the special train which will take a delegation of Minneapolis business men on a trip through the northwest May 22-30. The booklet gives a short description of Minneapolis with a number of well selected photographs. It is bound in a neat green cover, bearing a colored view of the Great Northern's bridge across the Mississippi.

RAILWAY STRUCTURES.

AUGUSTA, GA.—The Georgia & Florida has let the contract for the addition of a second story to its terminal building at a cost of $125,000.

AVIS, PA.—An officer of the New York Central & Hudson River writes that a contract has been given to the Lackawanna Bridge Co. for putting up a semi-fireproof steel frame and concrete freight car shop, one story high, 200 ft. x 350 ft., at Avis, and the company is now buying tools and equipment.

BEMIDJI, MINN.—See Minneapolis, St. Paul & Sault Ste. Marie under Railway Construction.

BINGHAM, UTAH.—See Bingham & Garfield under Railway Construction.

CELILO, ORE.—An officer of the Oregon Trunk Railway writes that a contract for building the substructure of the large bridge over the Columbia river at Celilo, Ore., from the state of Oregon to the state of Washington, has been let to Porter Brothers, Portland, Ore. Contract for the superstructure and erection of the bridge will be let by Jno. F. Stevens, president, Portland, Ore. There are to be 30 spans, as follows: Five 75-ft. deck plate girder spans, one 230-ft. draw span through truss, one 320-ft. through span, six 230-ft. through spans, sixteen 102-ft. plate deck girder spans. Total length of bridge, 3,957 ft., including the two Y connections on the north end. In addition to crossing the Columbia river, the bridge crosses the Oregon Railroad & Navigation Company's double track on the south side of the river, with a clearance of 22 ft., and the United States canal with a draw span 230 ft. long, 115-ft. span on each side of the center pier. The 320-ft. span is across the main channel of the Columbia river. All the foundations for piers will be on solid rock and the foundations for each pier will be above low water in the river. The bridge crosses just above what is known as the Celilo Falls, and will be a very picturesque location. The line of the Oregon Trunk Railway connects with the Spokane, Portland & Seattle Railway at the north end of the bridge with a Y on 8 deg. curves, part of which is on the bridge. The remainder of the bridge is on a tangent. The bridge is expected to be finished about June 1, 1912. Pending the completion of the bridge the company will operate a ferry across the river about three miles east of the bridge to transport track and other material across the river to complete the first 150 miles of line now under construction.

CLEBURNE, TEX.—The Gulf, Colorado & Santa Fe has prepared plans for a power plant, the equipment for which has not yet been decided on.

GONZALES, TEX.—According to press reports, the San Antonio & Aransas Pass will soon begin work on a new passenger station in Gonzales.

HAMMOND, IND.—The Indiana Railroad Commission has ordered the Chicago, Indianapolis & Louisville to build a new passenger station in Hammond.

KANSAS CITY, KAN.—The Missouri Pacific passenger station will be opened for service June 1. It is a three-story building of buff brick. (February 11, 1910.)

LOGANSPORT, IND.—The Pennsylvania Railroad plans to build a new double-track bridge over the Wabash river to replace the present single-track structure.

MONTREAL, QUE.—The Canadian Pacific has decided to reconstruct the large bridge over the St. Lawrence river, just above Montreal, at a cost of $1,500,000. The present bridge, which is single-track, will be made a double-track structure.

NEW CASTLE, IND.—The Lake Erie & Western has started work on a combined passenger and freight station at New Castle. (Apr. 22, p. 1069.)

SPRINGFIELD, MO.—The St. Louis & San Francisco has taken a 10-year lease on a 3-story office building of pressed brick to be built at Olive and Jefferson streets.

STILLWATER, OKLA.—See Oklahoma Public Service & Interurban under Railway Construction.

SWALLOWS, COLO.—See Denver & Rio Grande under Railway Construction.

TUSCALOOSA, ALA.—See Tuscaloosa Mineral under Railway Construction.

WEATHERFORD, TEX.—The Gulf, Colorado & Santa Fe has prepared plans for a $15,000 passenger station.

Late News.

The items in this column were received after the classified departments were closed.

Bellow & Morritt, Tuckahoe, N. Y., have ordered one saddle tank locomotive from the American Locomotive Company.

Plans have been submitted by the Oregon Short Line, it is said, to the city council of Pocatello, Idaho, for a viaduct and subway, to cost $200,000.

The Atlantic Coast Line will build seven additional warehouses on its waterfront property in Savannah, at a cost of about $100,000. Extensive improvements are also to be made to the wharves at a cost of about $150,000.

An officer of the Chicago, Milwaukee & St. Paul writes that land approximating about 800 acres has been bought west of Franklin Park, to be developed for yard purposes. Plans are not yet sufficiently advanced to give any particulars.

Attorneys for the twenty-five western railways temporarily restrained from advancing freight rates by Judge David P. Dyer, of the United States Circuit Court, will meet at once in St. Louis to plan an answer to the government's suit.

An officer of the Chicago, Burlington & Quincy writes that nothing definite has been done towards building a bridge over the Ohio river at Metropolis. Application has been made for authority to build the bridge, but it has not yet been granted.

The Oregon & Washington is said to have plans made and is ready to ask for bids for constructing a viaduct and retaining wall of reinforced concrete, to have a total length of 2,500 ft., in Seattle. The cost of the improvements will be about $200,000.

James R. Paterson, for many years advertising manager of *Railway and Locomotive Engineering*, and since April 1 a representative of the Commercial Acetylene Co., New York, died at Cranford, N. J., on May 31. He was prominent in the railway supply business.

All the employees of the Atchison, Topeka & Santa Fe Railway receiving less than $80 a month are to receive an increase of 10 per cent. in wages. This applies to all employees except those with whom the company has union agreements. The raise went into effect June 1.

The Pennsylvania Railroad has filed a new tariff of fares between points on the eastern end of its New York division and New York. This tariff shows a slight increase in the cost of regular commutation forms of ticket as well as in some forms of one-way and excursion tickets.

F. W. Coolbaugh, president of the Provincial Steel Co., Cobourg, Ont., who organized the company, constructed its plant and put it on a successful operating basis, has sold his interest to Robert Heath, of England, and returns to Philadelphia, Pa., to devote his time to his interests in the United States.

The Pine Bluff & Northern was granted a charter May 26 to build from Pine Bluff, Ark., north to Searcy, 80 miles. The work will be light, being mostly dirt work. The company expects to begin the construction work soon. Walter J. Miller, president, Lamar, Mo.; F. C. Kyte, engineer, Carlisle, Ark.

Contracts have been let for the general construction of the Beech Grove shops for the Cleveland, Cincinnati, Chicago & St. Louis to the Warren Construction Co., Chicago; for the structural steel, to the McClintic-Marshall Co., Pittsburgh, Pa., and for the yard system, including tunnel, sewer, water, etc., to the Carson-Payson Co., Danville, Ill.

The railways in Trunk Line territory have granted the application of the Merchants' Association of New York for merchants' rates to that city. The fare granted is a rate and one-half for the round trip, under the certificate plan, effective on 16 dates, arranged in four series of four each as follows: July 16-19, inclusive; August 13-16, inclusive; August 27-30, inclusive, with the usual fifteen-day limit.

The Central of New Jersey has filed increased commutation rates, effective July 1, from New York city to New Jersey points. The advances average from 10 to 12 per cent. over present rates. The road will continue the sale of commutation tickets on the scale basis. A regular commuter who purchases a commutation ticket during the life of the tariff is given a reduction each month for a full year.

General Manager A. T. Dice, of the Philadelphia & Reading, has signed an agreement with representatives of the conductors and trainmen granting the standard rates of pay and service conditions secured on most of the other railways in the East. Similar negotiations have been concluded on the Central of New Jersey. The new schedules in both cases were made effective as of May 1 last. These two roads are the only ones on which settlement has been made without the necessity for convening the grievance committees of the trainmen and conductors. At a conference some weeks ago, President Baer assured the trainmen that on the Reading and Jersey Central rates of pay should be brought up to any standard which might be established in the East. The award of the arbitrators on the New York Central lines, East and West, was considered to have established the Baltimore & Ohio scale of wages as standard. The officials of both roads, after conferences with the trainmen and conductors, applied these rates voluntarily and agreements to this effect have been signed.

When the railway bill was taken up in the Senate Wednesday Senator Stone of Missouri spoke in support of his proposed amendment regulating issues of stocks and bonds. This is really the Dolliver amendment reoffered by Senator Stone. The La Follette amendment directing the physical valuation of railways was defeated by a vote of 30 to 25. After the defeat of the La Follette amendment, Senator Cummins introduced another form of an amendment providing for physical valuation, and it was defeated by a majority of two votes, 28 Senators being a line-up of the insurgents and Democrats, voting for the amendment, while 30 regular Republicans voted in the negative.

An amendment by Simmons (Democrat, N. C.) providing that in administering the "long and short haul" clause, no rate should be made by the Interstate Commerce Commission that will destroy water competition, was adopted.

An amendment by Senator Burton (Republican, Ohio) supplementing the Simmons amendment protecting water transportation from ruinous railway competition was agreed to by an almost unanimous vote, there being only one vote against it, that of Senator Frye of Maine. There were 53 votes for it. Burton's amendment provides that the Interstate Commerce Commission may fix the minimum rate to be charged by a railway in competition with water transportation companies; also that a railway competitor, once having lowered its rates, cannot increase them again without consent of the Interstate Commerce Commission.

Chairman Elkins accepted an amendment offered by Shively (Democrat, Ind.) giving to shippers a right of action in civil suit against a railway, its agents or officers who refuse to give information (on application of the said shipper) concerning rates, routes, etc. Under the bill (section 8) the government can proceed against a railway and its agents to recover $250 for each refusal to give a shipper the information. Shively said his amendment was to make it certain that the shipper did not lose his right of action for damages growing out of such refusal to give information.

Senator Burton of Ohio secured the adoption of an amendment imposing heavy penalties on railways and their agents who give information concerning shipments to any corporation or person not authorized to receive it. It also penalizes the corporation or person improperly receiving or soliciting such information. This amendment is aimed at the Standard Oil Co., which, Senator Burton explained, had been improperly obtaining information regarding shipments by its competitors, as shown in recent cases against the Standard.

Senator Newlands (Democrat, Neb.) on Wednesday offered his amendment for federal incorporation of holding companies; this amendment was defeated without division or roll call. He said in his speech before the Senate that he would substitute the United States for New Jersey as the sovereign incorporating agent.

Equipment and Supplies.

LOCOMOTIVE BUILDING.

The Canadian Pacific is said to have ordered 10 consolidation locomotives from the American Locomotive Co.

The Northern Pacific Terminal Co. has ordered three six-wheel oil-burning switching locomotives from the American Locomotive Co.

The Boston & Maine has ordered 10 mogul freight, 10 six-wheel switch, 20 eight-wheel passenger and 10 consolidation locomotives from the American Locomotive Company.

The Chicago, Burlington & Quincy, reported in the *Railway Age Gazette* of May 13 as being in the market for 50 Mikado locomotives, has ordered these from the Baldwin Locomotive Works.

CAR BUILDING.

The Carolina, Clinchfield & Ohio is in the market for 250 box cars.

The Georgia Railroad is in the market for 65 box, 25 coal and 10 stock cars.

The Georgia & Florida has ordered four coaches from the Hicks Locomotive & Car Works.

The Oklahoma Public Service & Interurban Lines, R. A. Sturgeon, Stillwater, Okla., are in the market for electric cars.

The Canadian Pacific is said to have ordered 203 refrigerator, 76 box, 50 horse, 14 stock, 25 flat, five freight and one ballast car from its Angus shops. This item is not confirmed.

The Missouri, Kansas & Texas has ordered 200 automobile, 50 steel underframe flat and 50 gondola cars from the American Car & Foundry Co. This equipment is in addition to that previously reported.

The Baltimore & Ohio, reported in the *Railway Age Gazette* of May 20 as being in the market for box and coke cars, has ordered 1,000 40-ton capacity box cars from the Standard Steel Car Co. for delivery this fall.

The St. Louis & San Francisco has ordered 500 box cars, divided equally between the Pullman Co. and the American Car & Foundry Co. This company is still in the market for the 500 automobile cars and 250 tank cars mentioned in the *Railway Age Gazette* of May 6.

The Interborough Rapid Transit Co., New York, has ordered 40 trailer cars from the Wason Manufacturing Company, 40 motor cars from the Jewett Car Company and 20 motor cars from the Cincinnati Car Company. This equipment will be used on the elevated lines.

The Harriman Lines freight cars, reported in the *Railway Age Gazette* of May 27, will have the following dimensions: Box, over all, length, 41 ft. 1 1/16 in.; width, 10 ft. 6 in.; height, 14 ft. 8¾ in.; inside, length, 40 ft., ⅛ in.; width, 9 ft. 2 in.; height, 9 ft. 2¼ in.; light weight, 40,650 lbs. Automobile, general dimensions, same as box; side doors, height, 8 ft. 8⅞ in.; width, 9 ft. 8½ in.; end doors, height, 8 ft., 9⅜ in.; width, 7 ft. 6 in.; light weight, 43,460 lbs. Stock cars, over all, length, 37 ft. 10 in.; width, 9 ft. 11⅛ in.; height, 13 ft. 5¼ in.; inside, length, 36 ft. 6⅛ in.; width, 8 ft. 5⅜ in.; height, 8 ft. ¼ in.; light weight, 35,241 lbs. Flats, over all, length, 41 ft. 2¼ in.; width, 9 ft. 10½ in.; height, 6 ft. 9½ in.; inside, length, 40 ft. 10 in.; width, 9 ft. 4½ in.; height, 3 ft. 10 11/16 in.; light weight, 30,500 lbs. Hart convertible, over all, length, 41 ft. 6 in.; width, 10 ft. 9⅜ in.; height, 8 ft. 4¼ in.; inside, length, 40 ft. as a gondola, 30 ft. as a hopper; width, 8 ft. 8 in.; height, 3 ft.; cubic capacity as a gondola, 1,040 cu. ft., as a hopper, 928 cu. ft.; light weight, 39,500 lbs. Hopper bottom coal cars, over all, length, 31 ft. 6 in.; width, 10 ft. 5⅞ in.; height, 10 ft. 9⅛ in.; inside, length, 30 ft. ¼ in.; width, 9 ft. 6 in.; height, 5 ft. 9¼ in.; capacity, 1,650 cu. ft.; light weight, 39,600 lbs. Drop bottom gondolas, over all, length, 41 ft. 10 in.; width, 10 ft. 4¾ in.; height, 8 ft. 8 5/16 in.; inside, length, 40 ft. 4 in.; width, 9 ft. 4⅞ in.; height, 4 ft. 6 in.; light weight, 40,270 lbs. Tight bottom gondolas, dimensions same as drop bottom gondolas; light weight, 37,000 lbs.

IRON AND STEEL.

The Great Northern has ordered 3,500 tons of bridge steel from the American Bridge Co.

The Colorado & Southern has ordered 550 tons of bridge steel from the Wisconsin Bridge Co.

The Chicago, Lake Shore & South Bend has ordered 800 tons of 70-lb. rails from the Illinois Steel Co.

The Toledo & Ohio Central has ordered 400 tons of bridge steel from the Toledo-Massillon Bridge Co.

The Minneapolis, St. Paul & Sault Ste. Marie has ordered 4,400 tons of structural steel for bridges and ore chutes from the American Bridge Co.

The Illinois Traction System has ordered 1,000 tons of bridge steel from the McClintic-Marshall Construction Co. for a viaduct at Springfield, Ill.

The Chicago, Milwaukee & St. Paul has ordered from the Wisconsin Bridge Co. 650 tons of bridge steel for a viaduct in Idaho, and 1,000 tons for a viaduct at St. Paul, Minn.

The Cleveland, Cincinnati, Chicago & St. Louis has ordered 1,500 tons of bridge steel from the McClintic-Marshall Construction Co. for its Wabash river bridge at Mt. Carmel, Ill.

General Conditions in Steel.—Although there are some fairly large steel orders pending, the steel market, as regards new business is quiet at the present time. Consumers seem to show an inclination to hold out of the market, but the manufacturers are said to be looking for activity in the near future. Structural steel orders placed during May were the largest so far this year and rails were also more active. From the standpoint of earnings, many of the independent steel companies report an average increase of nearly 10 per cent. in May over April, with prospects of their mills running full for the next four months at least.

SIGNALING.

Alternating Current Signaling Patent Decision.

On May 28 Judge Ray, of the United States Circuit Court, Southern District of New York, rendered an important decision. Two suits were brought by the Union Switch & Signal Co., Swissvale, Pa., against the General Railway Signal Co., Rochester, N. Y., for infringement of the Struble patents in the installation made by that company on the New York Central & Hudson River, Electric Zone. A third suit was brought by the General Railway Signal Co. against the Long Island Railroad for infringement of the patents of S. Marsh Young in the installation of electric block signals made by the Union Switch & Signal Co. on the electrified portion of the Long Island Railroad. The defense of this latter suit was assumed by the Union Switch & Signal Co. The text which follows consists of verbatim excerpts from the opinion of Judge Ray:

"The Union company claims that Struble was and is the pioneer in the matter of block signaling on electric railways; that he was the first to provide a system of electric block signaling on electric railways; that he was the first to provide such a system wherein interference between the signaling and power circuits was prevented, and that he accomplished this by using a current for signaling which was different from the car propulsion current; that is, by using a direct current for operating the car motors and an alternating current for energizing the signal relays. The Union company contends that no prior patent or publication shows this, and that as the claims of the Struble patent do, the fact of pioneership is established.

"The defendant, the General company, insists that the

Struble patents are void for want of patentable novelty; that defendant does not infringe and that during the pendency of the applications the claims were unwarrantably amended by including new matter. The defendant says that these patents relate simply to the application of the ordinary block signaling system then in common use on steam railways to an electric railway system; that is, that the patents in suit merely add or apply the old block signaling system to the electric railway without making any changes of adaptation or securing any new and different results, and refers to several prior patents which it claims show this. The defendant says there was 'no invention involved in adding Schreuder, Roome and Spang systems to an electric railway'; 2, 'The Struble patents are anticipated'; 3, 'Defendant does not infringe'; and 4, that the patents in suit contain new matter not disclosed in the original application, and that, while an application for a patent and the claims may be amended, under no circumstances can the application be amended into a new or a different invention than that first claimed. The defendant insists that the new matters introduced into the Struble applications were not only not disclosed in the original application, but were and are directly contradictory thereto. Also that the rights of Stillwell and of Young accrued before Struble made either of the claims upon which suit is brought. . .

The Union company says that the first work of closed track-circuit signaling on electric railways was done by it in 1900-1901 on the Boston Elevated under this last mentioned patent [Struble, 590,600] and under the direction of Struble and employed what it terms the "All-direct-current idea of means for the reason there was a direct current for the signaling current and a direct current for the car propulsion current." Waterman (plaintiff's expert) says of it "Struble's Boston railway system was based on a definite and positive direction of flow of the propulsion current in the rails and a signal current, which was also a direct current applied to flow in an opposite direction in the rails, and hence was limited to special cases where uniform direction of flow of the propulsion current could be secured."

The complainant (Union company) says that the art rested here until Struble made the next advance step by introducing into the art the "Distinctive current idea of means" shown by the patents in suit, in which an alternating current, differing in character from the direct current used for propulsion purposes, was employed in the track signaling circuit. This is what the complainant says is the generic invention of the patents and that it solves the problem of applying the closed track circuit system of signaling to electric railways, and that this idea of means involves a distinguishing apparatus in its embodiment and this irrespective of whether one or both track rails are used to return the car propulsion current; that the specific two rail return invention in all its forms, is one of the advantages growing out of the generic invention and that because of this distinctive current idea of means it is possible to retain the ordinary two rail return by the use of "reactances" in various location on the track way. Waterman says, "The fundamental idea of means upon which the arrangements of the patents in suit are made may properly be designated for brevity as the distinctive current idea of means, since the fundamental conception was the application to the rails of a signal current of distinctive characteristics from that necessarily existent in the rails for purposes of propulsion."

If it be true that a system of automatic electric signaling has been devised for electric roads and put in successful operation, and this system is such that this direct propulsion current by leakage or going astray does not seriously interfere with the signals, or their operation, or operative effectiveness, we have a most valuable discovery and invention; one the value of which cannot be overestimated. I think this has been done and that Struble is entitled to the credit. I do not find it anticipated, or that by taking the suggestions of the prior art and bringing them together and applying them to electric railway signaling, Struble was doing the work of the mechanic skilled in this art. It was an important field and an open one. It was not an obvious thing to do. I am clear that the inventive faculties of many were exercised in the effort but that those of Struble accomplished the desired object. * * *

There was an interference declared in the patent office between Struble and Young involving the very questions presented here. The examiner of interferences awarded priority of invention to Young, but this was reversed by the Board of Examiners in Chief and the decision of this board was affirmed by the commissioner. On appeal to the Court of Appeals, District of Columbia, this decision of the commissioner was affirmed. Samuel Marsh Young, appellant, v. Jacob B. Struble, respondent, Patent Appeal No. 597, opinion by Justice Van Orsdel, filed December 14, 1909. This thorough examination of the question of priority of invention as between Young and Struble by four tribunals, so to speak, examiner, board of examiners, commissioner and Court of Appeals, and the conclusion reached, while not binding on this court, is entitled to great consideration and respect. I would not follow the judgment of the commissioner and the Court of Appeals did they not agree with my own judgment. I have carefully examined the authorities cited by the learned counsel for the General company, the evidence and the able argument presented, but am forced to the conclusion that the decision was right. While the opinion of Justice Van Orsdell does not embrace all that might be said, it covers all the salient and determining points and is quite conclusive.

It seems clear, if the Court of Appeals was talking to the point involved, that the commissioner and court decided the question of priority of invention of this two-rail return system in combination with the use of the alternating current for signaling and direct current for propulsion, both currents using the same rails, the one current not mixing, so to speak, with the other, and the use of a signal and signaling apparatus capable of distinguishing between the two currents and answering to the one and not to the other, etc., all in electrical signaling on electric roads. The court points out the dates of filing by Struble and Young and also the amendments of Struble to his applications for his patents now in suit and discusses and determines his right to make such amendments. I cannot read that opinion other than as deciding between Struble and Young, that Struble was the first to invent, claim, etc., and that he had the right to make and file the amendments now challenged. * * *

These being my conclusions there will be a decree in favor of the Union Switch & Signal Co., complainant in the suits brought by it against the General Railway Signal Co., and in favor of the Long Island Railroad in the suit brought against it by the General company and Young. I think the successful party in each case should have costs. In view of the interests involved, and assuming the defendant parties will desire to take an appeal, the issue of an injunction will be suspended pending such appeal or appeals provided same is taken within thirty days and prosecuted with diligence, but a suitable bond should be given to pay all costs and damages awarded by the final decree in case of affirmance and suitable orders to that effect may be submitted with the proposed decrees. This will save formal applications.

Southern Siamese Railway Equipment.

The first specifications for tenders for the Southern Siamese Railway were issued on July 19, 1909, and were for tools and other plant, but on account of the limitation of time in delivery did not permit of bids from abroad, and therefore the contracts were awarded to local firms. The second specifications for tenders for five tank locomotives, five rail wagons and 125 ballast wagons were issued on September 18, 1909, and the tenders were opened on January 28, 1910, comprising 41 for engines and 42 for ballast wagons. The tenders from German firms were the lowest, ranging as low as $21,731 for engines and $36,295 for the ballast wagons. Two American firms tendered for engines at $34,650 and $29,569, respectively. No bids for ballast wagons from American firms were received. The lowest bid from British firms for engines was $27,730. The railway department states that several of the tenders are accompanied by letters in which extra rates are asked for if the more approved class of design and material should be required. In awarding the contracts the engines were ordered from an English firm at its bid of $27,730, although German tenders were lower. The award for the wagons was given to a French firm at $47,450.

Shop Equipment.

American Full Universal Triple Geared Radial Drill.

The illustrations herewith are of a triple geared radial, a new development in drills being introduced by the American Tool Works Co., Cincinnati, Ohio. This machine, built in 4-ft., 5-ft., 6-ft. and 7-ft. arm sizes, is very rigid, accurate in its alinements and arranged to be operated with greatest possible ease. The 4-ft. arm size is designed to pull a 6-in. pipe tap, while the 6-ft. arm size is designed to pull an 8-in. pipe tap. The frictions in the tapping attachment are this company's patented double band type, which consists of an internal expanding and an external contracting friction in one. The company claims that there is perhaps no one feature in the machine which is more responsible for its great pulling power than this double band friction, since the power of the radial drill is not dependent upon the size of the gearings, shafts, etc., but rests entirely with the capacity of the frictions, and the power that can be transmitted to the twist drill is only equal to that which causes the friction gears to slip.

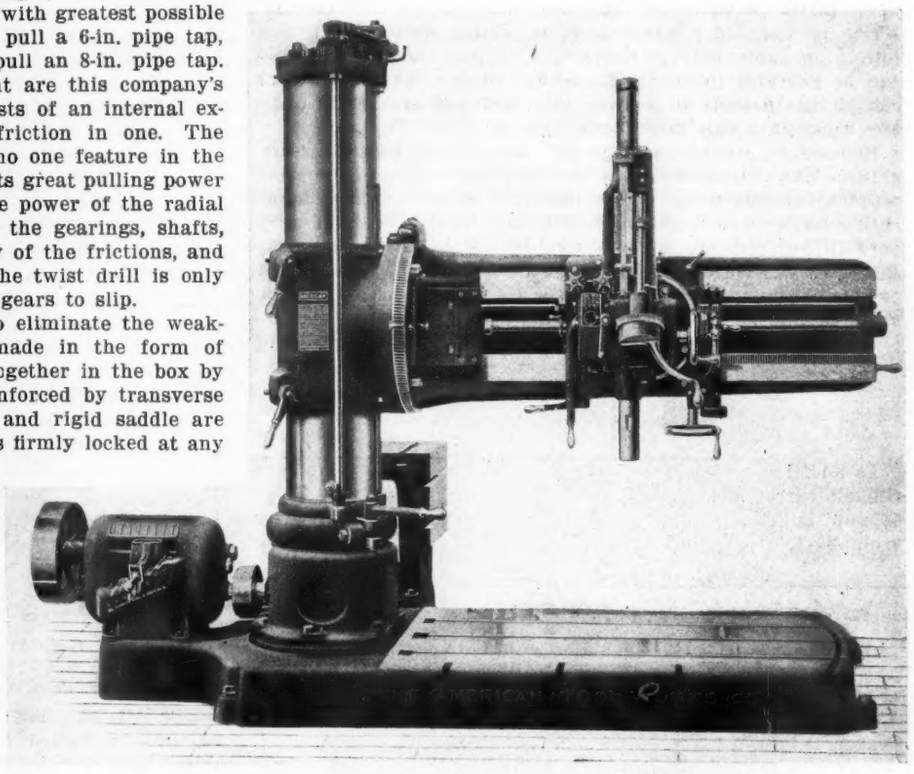
The design of the arm is intended to eliminate the weaknesses heretofore encountered. It is made in the form of upper and lower tube sections, bound together in the box by a double wall of metal and further reinforced by transverse ribbing. The ways carrying the wide and rigid saddle are formed on the front wall. The saddle is firmly locked at any point along the arm by a clamping device, which also binds together the double arm section and the saddle into a compact unit, affording great strength for resisting strains. The arm is clamped to the column by two binder levers and is raised and lowered rapidly by a double-thread coarse pitch screw hung on ball bearings. This lever cannot be operated until slightly raised from its bearings, thus guarding against accident through unintentional movement while the arm is clamped to the column. The arm is rotated in a circle by a worm wheel cut in the periphery of the arm flange. This movement, in connection with the swiveling pin, permits drilling and tapping at any angle.

The head is of compact design and equipped with steel triple gears. It may be swiveled through a circle by a hand wheel and worm which engages a worm gear fixed to the head. This feature is of special value in setting the spindle for angular drilling. The worm holds the swiveling head in any position and eliminates the possibility of accidents through the head swinging around of its own weight when the clamping bolts are loosened. The head is moved rapidly along the arm by multiple gearing and a rack through the same hand wheel that swivels the head.

The saddle shaft, which forms a part of the power transmitting elements between the arm shaft and the spindle, is offset to one side of the spindle and is mounted in two long bearings, one of which is integral with the saddle and the other with the swiveling head. Power is transmitted from the saddle shaft through miter gears to a shaft in the front of the head from which the spindle is driven through spur gears. The spindle has 24 speed changes, speed box or cone pulley drive, with double friction counter shaft advancing in geometrical progression, ranging from 19 to 314 r.p.m. The wide range of speeds obtainable with its power and rigidity render this drill equally efficient when using either the ordinary carbon or high-speed twist drill, and particularly fits it for a wide range of tapping requirements.

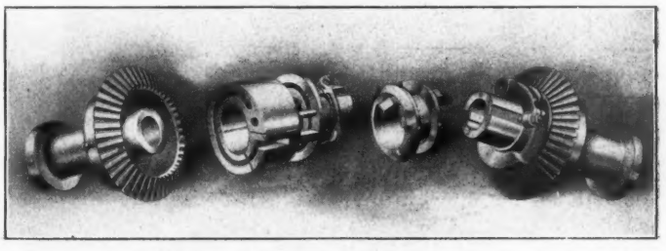
The triple gears are made of steel and provide one direct and two reduced speeds through the spur gears and the positive clutches. They are operated from the front of the head saddle by a convenient lever without stopping the machine. The triple gears are mounted on the back of the saddle and are fully enclosed by the upper walls of the arm, thus permitting the universal arm to be rotated through a circle. The feeding mechanism is located on the head and provides eight distinct rates of positive geared feed covering a range in geometrical progression from .006 in. to .060 in. per revolution of spindle. This mechanism is controlled by two dials, on the face of which the respective feeds are plainly indicated. The feed train is engaged and disengaged at the worm wheel through a friction clutch and lever, which lever also controls the quick advance and return of the spindle.

The depth gage and automatic trip are of improved and simplified design and will trip the spindle at any point within



American Full Universal, Triple Geared Radial Drill.

the limit of travel. This trip acts automatically at the full travel of the spindle to prevent any breakage to the feed mechanism, which latter may be tripped by hand at any point. The tapping mechanism is mounted on the girdle portion of the arm. This mechanism operates through double band friction clutches. The lever for operating this mechanism is placed on the front of the saddle and controls the starting, stopping and reversing of the spindle. Owing to the fact that the tapping attachment is located between the speed box and the triple gears, the frictions receive the benefit of the



Double Band Friction Clutches.

triple gear ratio and have comparatively light duty to perform, thus making possible unusually heavy tapping without undue strain and also permitting taps to be withdrawn at high speeds.

The column is of the double tubular type, the sleeve or outer column revolving on conical roller bearings. The column may be clamped in any position by a patented V clamping ring, which when clamped, binds the column sleeve firmly to the inner column or stump, which extends through the entire length of the sleeve and has a long bearing for the

outer column at both top and bottom. This construction provides the equivalent of a double column and affords great rigidity.

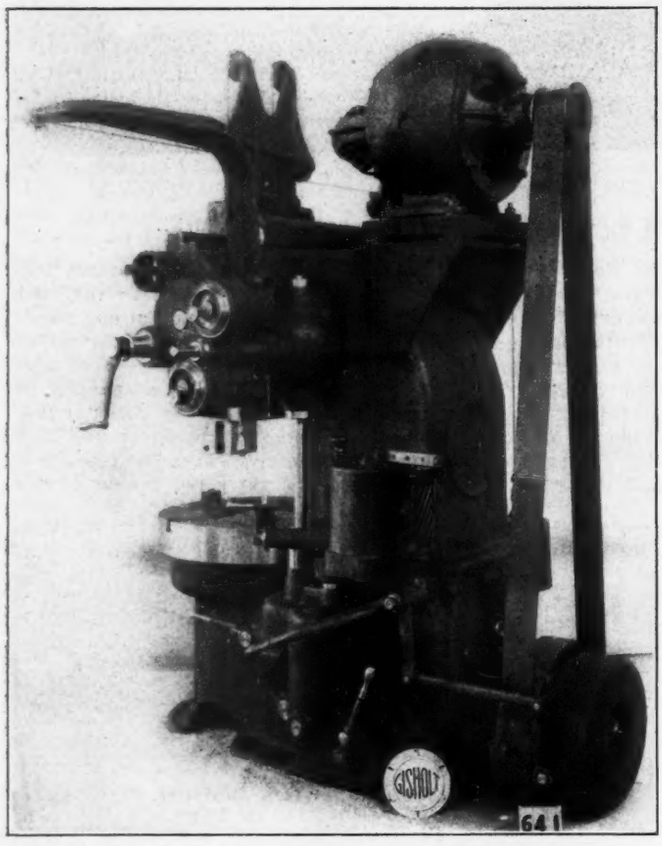
The speed box is of the cone and tumbler type, providing eight changes of speed. All gears in the box are made of steel, of coarse pitch and wide face, of the B. & S. 20-deg. involute pointed tooth system. An auxiliary train of gearing between the pulley and cone shaft is also provided.

The plain box table has a 28-in. x 28-in. top surface and also a liberal side surface, thus providing the equal of an angle plate. A universal table, consisting of a swivel base on which is mounted a heavy housing which carries the tilting top of the table, may be supplied with this machine. Its top can be swiveled to any angle within 90 deg., and either face can be set in vertical position by a segment and worm operated through a pair of reduction gears.

Renewable bronze bearings are used throughout this machine. The increased speeds and feed possible with the most modern machine tools require that they have very good lubricating facilities, and this feature is said to have received very careful consideration in the design of this machine. All gears subjected to severe duty are made of steel, the pinions being cut from bar stock while the gears are made from high grade steel castings. The regular equipment of this machine includes a plain box table, counter shaft, cone pulley drive and wrenches.

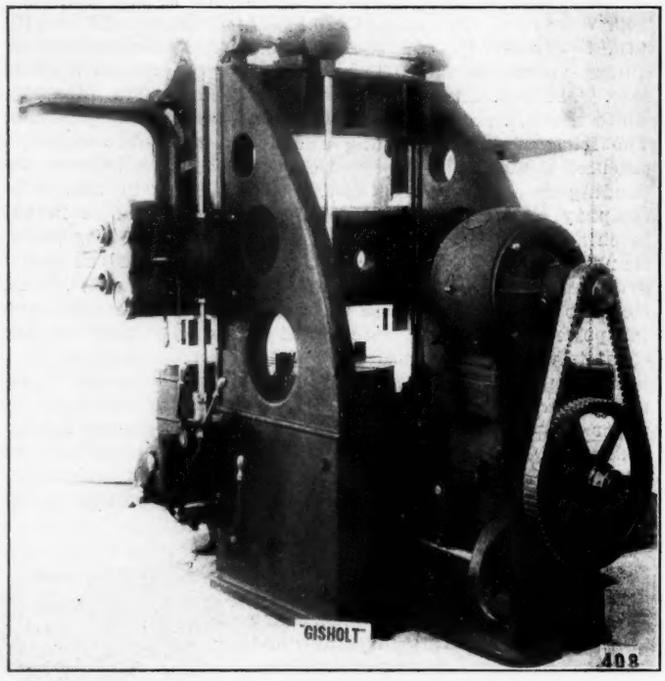
Gisholt Boring Mills.

In addition to its large business in the manufacture of the Gisholt turret lathe, the Gisholt Machine Co., Madison, Wis., is now building a line of boring and turning mills in sizes from 30 in. to 84 in., and its long experience in the manufacture of lathes has been especially useful in the production of boring mills for rapid and accurate work, having important departures from the ordinary standard designs. The friction head stock was adapted to the boring mills and was successful from the start. By a convenient arrangement of levers the operator was given complete control of the table while standing at his usual position, and this was at once recognized as a decided improvement in this type of machine tool.



Gisholt Single-Head Boring Mill.

The work usually finished on boring mills is of such a character that measuring by caliper and scale is necessary and at each scaling of the work there is required a stopping of the table, thus needlessly consuming much time. The Gisholt mills were, therefore, equipped with micrometer indexes on all feeds, enabling the operator to produce more accurate work than had been possible before. A feed trip was also designed for these mills so that the operator is able to set the feed so it would stop automatically at any desired point and this feed trip is positive and accurate. For rapid work, mechanism is required for quick and easy changes in feed and table speeds and the machine should be sufficiently powerful for the heaviest work of high speed steel. By the combination of the above devices in the Gisholt mills they now occupy in the trade a position as essentially rapid production machine tools. The 30 and 36-in. machines have single swivel heads and the large mills have double heads. The single head machines when belt-driven have a 4-step cone-pulley with two speed counter shafts and eight feeds. The double head mills are equipped with friction back gear headstock, giving six changes of speeds and through the two speed counter-shafts a total of 12 table speeds are available. These mills are also designed for motor drive and the illustration shows the design for this purpose in the single and double head mills.



Gisholt Double-Head Boring Mill.

In the former a variable speed motor, ranging from 400 to 600 r.p.m. is used. The 30-in. mill requires a 3-h.p. motor and the 36-in. a 4½-h.p. motor. The drum type non-reversing controller is conveniently located. In the larger sizes above 36 in. the motor is mounted directly on the head stock and the connection is made by silent chains or gears. The motor has a speed ranging from 600 to 900 r.p.m. and the power ranges from 7½ to 11 h.p.

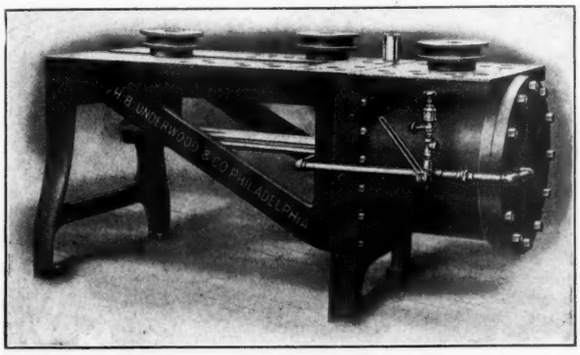
Pipe Bender.

This machine, made by H. B. Underwood & Co., Philadelphia, Pa., can well be considered a power bender and a bulldozer. It has a 20-in. diameter cylinder with a stroke of 15 in. The table is rectangular in shape, of ample dimensions and has numerous holes for the convenient location of dies or pins. By merely changing the position of the resistance studs many different shapes may be made without the use of a large number of dies.

The ram is placed underneath the table and slides in a

strongly built guide. Projecting from the ram and above the table is a stud on which any suitable size roller may be placed. This machine may be operated by either steam or compressed air, metallic packing being used with the former and leather packing with the latter. Compressed air, however, offers many advantages where it is possible to use it.

The piston takes air on both sides at all times. The operating valve is so made that only the amount of air required for actual bending is used. The air is transferred from the front side of the piston to the back side, and it is forced forward, due to the fact that the available area of the back side of the piston is the greater by an amount equal to the cross section area of the piston rod. This feature permits the piston being moved very short distances or held stationary at any position for measuring, etc.

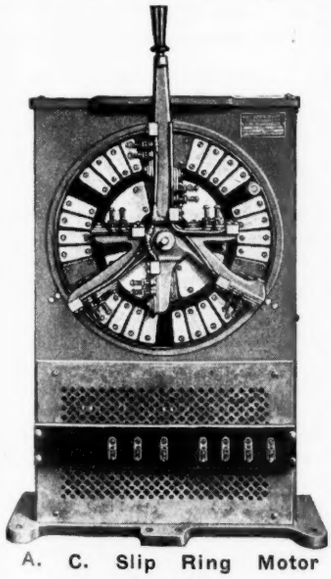


Underwood Pipe Bender.

A New Line of A. C. Controllers.

Until quite recently direct-current motors have been used most extensively for operating electrically-driven cranes and mill machinery. The flexibility and ease with which alternating current may be transmitted has, within the past few years, resulted in a large and increasing use of alternating-current motors for these applications.

For this character of work the series-wound direct-current motor has the desirable characteristic of high starting torque. In alternating-current motors this feature is very closely approached in the slip ring type of motor, and for the operation of cranes, mill tables and other reversing work of a similar nature, the development of the alternating-current motor has leaned heavily towards the use of the slip ring motor. Speed and torque control are obtained by inserting and varying resistance in the secondary winding of the motor.



A. C. Slip Ring Motor Controller.

The Electric Controller & Manufacturing Company, Cleveland, Ohio, has developed a comprehensive line of manually operated controllers for slip ring a.c. motors from 1 to 100 h.p. These controllers follow as closely as possible in design and construction the a.c. controllers which this company has been manufacturing for years. The wearing parts on its a.c. and d.c. controllers are, to a large extent, interchangeable.

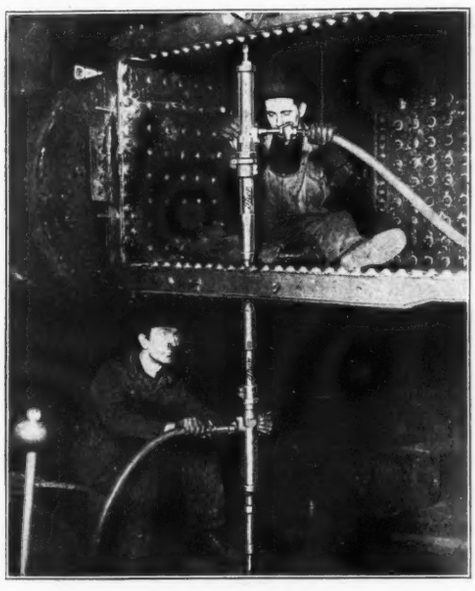
The controller illustrated is for use in connection with reversing slip ring motors, either two-phase or three-phase. The resistance is self-contained, it being necessary to connect but seven leads to the controller. Where heavy currents are to be handled cast grid resistance is employed, and particular precautions are said to have been taken to insure satisfactory insulation.

All contacts are mounted on a vertical slate face, so that mill dust cannot settle between segments and causing short circuits. All contacts are of heavy copper and reversible. The use of screws or bolts with special threads has been avoided, and so far as possible wearing parts have been designed so that they can be manufactured by the user in his own repair shop.

The operation of all of these controllers is by a lever motion, which the manufacturers consider advantageous for crane and mill service. Although the cut illustrates a controller for slip ring motors only, the company has furnished and is prepared to supply controllers for squirrel cage motors and a.c. commutating motors.

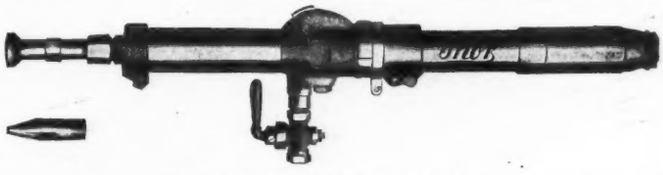
Pneumatic Staybolt Riveter.

The Independent Pneumatic Tool Company, Chicago, has designed a new tool for driving staybolts in locomotive fireboxes. It is constructed the same as the long stroke hammer with a barrel and plunger, but instead of the regular handle, it is provided with a holder-on, or plunger barrel, intended to hold the tool against the staybolt. The tools are used in pairs, as illustrated, one on each end of the staybolt, and they are started and stopped at the same time. This prevents the possibility of the staybolt being loosened while the second end is riveted over. The best way to drive staybolts in locomotive boilers with this device is to block the boiler up and place one of the drivers with the holder-on end on the ground with the set or hammering end on the staybolt, the second staybolt driver being placed inside the firebox, with the set against the opposite side.



Pneumatic Staybolt Riveters in Use.

When one side of the firebox has been completed the boiler is turned over and the staybolts driven, and in this way no extra support needs to be provided for the holder-on end. Two different centers are supplied, one cup-shaped and one pointed. The former fits over the end of the staybolt already in place and the pointed center fits into the hole before the staybolt is put on.



Pneumatic Staybolt Riveter.

The machines are provided with a throttle valve and a cut-off valve the same as the regular pneumatic hammer. After the set is placed on the staybolt the cut-off valve is open, and the plunger is held against the rear support, the

tool is ready for operation. The throttles on the two tools are then open at the same time and the hammers start. A locking device is provided for the trigger, so that the operator's hands are free to turn the tool back and forth while driving. Two different sets are provided, one plain and one with a taper point in the center. The former is cupped like the river set. It has a raised flange in the shape of a clover blade instead of two. This is for the purpose of reducing the surface in contact with the staybolt and gives the piston a better chance to upset the staybolt. The set is used on the inside of the firebox and the pointed set on the outside drill end, the point preventing it from closing the hole.

The valve mechanism is a new construction, both valve and block being hardened and ground. These staybolt drivers are a great improvement over the old method, as one man easily handles each tool, and the tools being self-supported, do not tire the operator with constant jar.

Magnetic Chucks.

The locomotive builders and machine tool makers are using magnetic chucks to advantage on planers, shaping machines and surface grinders, but few railway shops have adopted them, and it may be of interest to give some account of them. Magnetic chucks are used for holding iron or steel parts on machine tools without the use of bolts, straps or jaws. They are adapted to flat pieces either parallel or taper, such as gibs, keys, straight edges; for facing piston rings, discs,

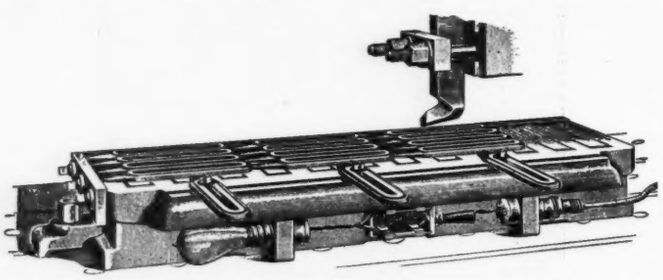


Fig. 1—Walker Magnetic Planer Chuck for Parallel Work.

washers and collars. They were first introduced in 1896 by the Walker Co., Worcester, Mass., and are now generally used in the more progressive machine shops. A number of difficulties have been overcome and the art has progressed so far as to make standardization possible. It was found desirable in large chucks to build them in separate magnetic sections, any one of which could be used separately. In making chucks for grinding machines it was necessary to adapt them to the floods of water used.

On large chucks, due to the action of residual magnetism, the work is sometimes difficult to remove after the switch is open. This was overcome by the use of a demagnetizing

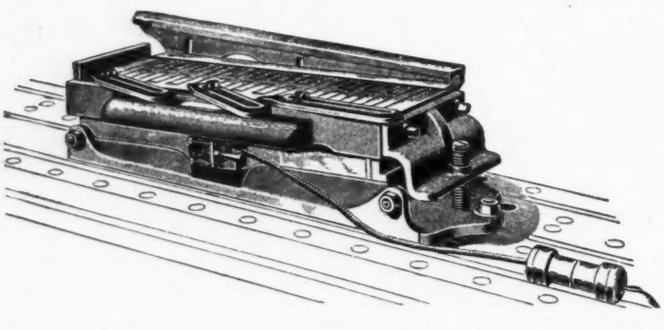


Fig. 2—Walker Magnetic Planer Chuck for Tapering Work.

switch, which frees the chuck face and leaves the work loose. The work itself is sometimes magnetized. For planer work magnetic chucks are not adapted for high work or for short pieces, or for work with a small area of contact surface. Where these chucks are adaptable for planer work they are a very desirable fixture, saving time, insuring greater accuracy, and enabling difficult work to be held that would seem almost impossible to hold by ordinary means. The planer tool will become magnetized and fine iron particles will adhere to it, but this is not found a serious objection.

Fig. 1 shows a large Walker chuck for a planer, which may be made either 31 or 36 in. long, and Fig. 2 shows another planer chuck arranged for holding tapering work. The chuck

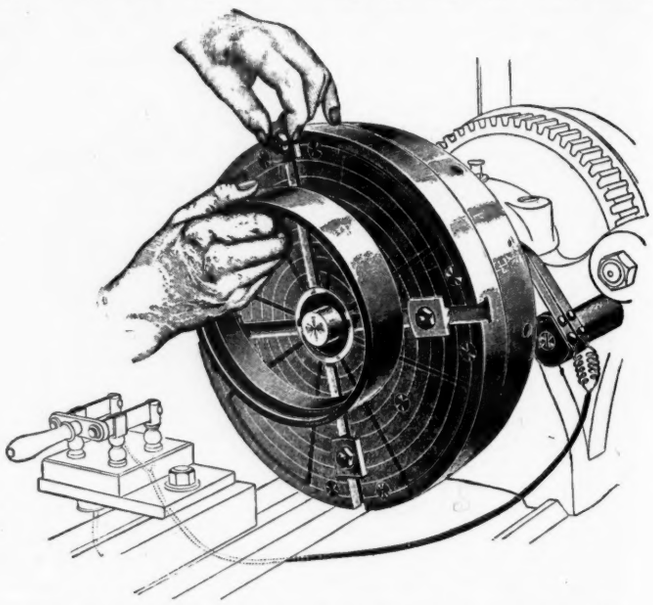


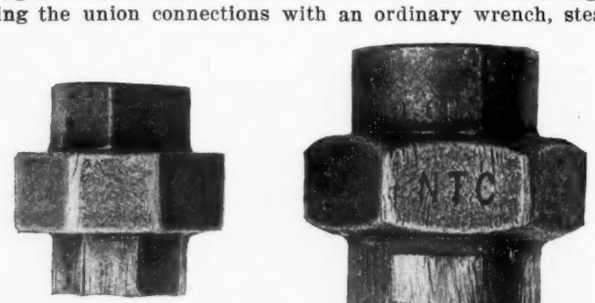
Fig. 3—Walker Magnetic Face Plate Chuck for Lathe.

is hinged on the bolt at the left, elevated by the screw in the end shield, and clamped by the bolt at the right. The principal use of magnetic chucks is for grinding purposes, and they are especially useful in the tool room. They are also used on rotary face plates as shown in Fig. 3, and are specially adapted for facing piston and packing rings, etc.

Alternating current cannot be used for these chucks. If water is used, the chucks must be specially fitted. The magnetic chucks here illustrated are manufactured by the pioneers in this industry, O. S. Walker & Co., Worcester, Mass.

Kewanee Pipe Union Test.

In the accompanying illustration are shown two Kewanee unions, an octagon and a round. These were taken at random from stock and tested as follows: The unions were placed in a steam line having three valves connected by nipples, there being a union on either side of the center valve. After tightening the union connections with an ordinary wrench, steam



Kewanee Pipe Unions.

pressure was admitted, the outer valve opened, the air blown from the piping and the valve closed. After allowing the pressure to act for a time, the steam was shut off, the outer valve opened to blow out the steam and the union unscrewed from the brass end. This operation is said to have been repeated over 1,000 times on each of the unions, and that neither showed the slightest sign of leakage of steam.

After the completion of this test, each union was taken to the company's union department and there subjected to the usual test, that of 100 lbs. air pressure under water. Each of these two unions is said to have been absolutely tight during the second test.

These unions are made by the National Tube Co., Pittsburgh, Pa.